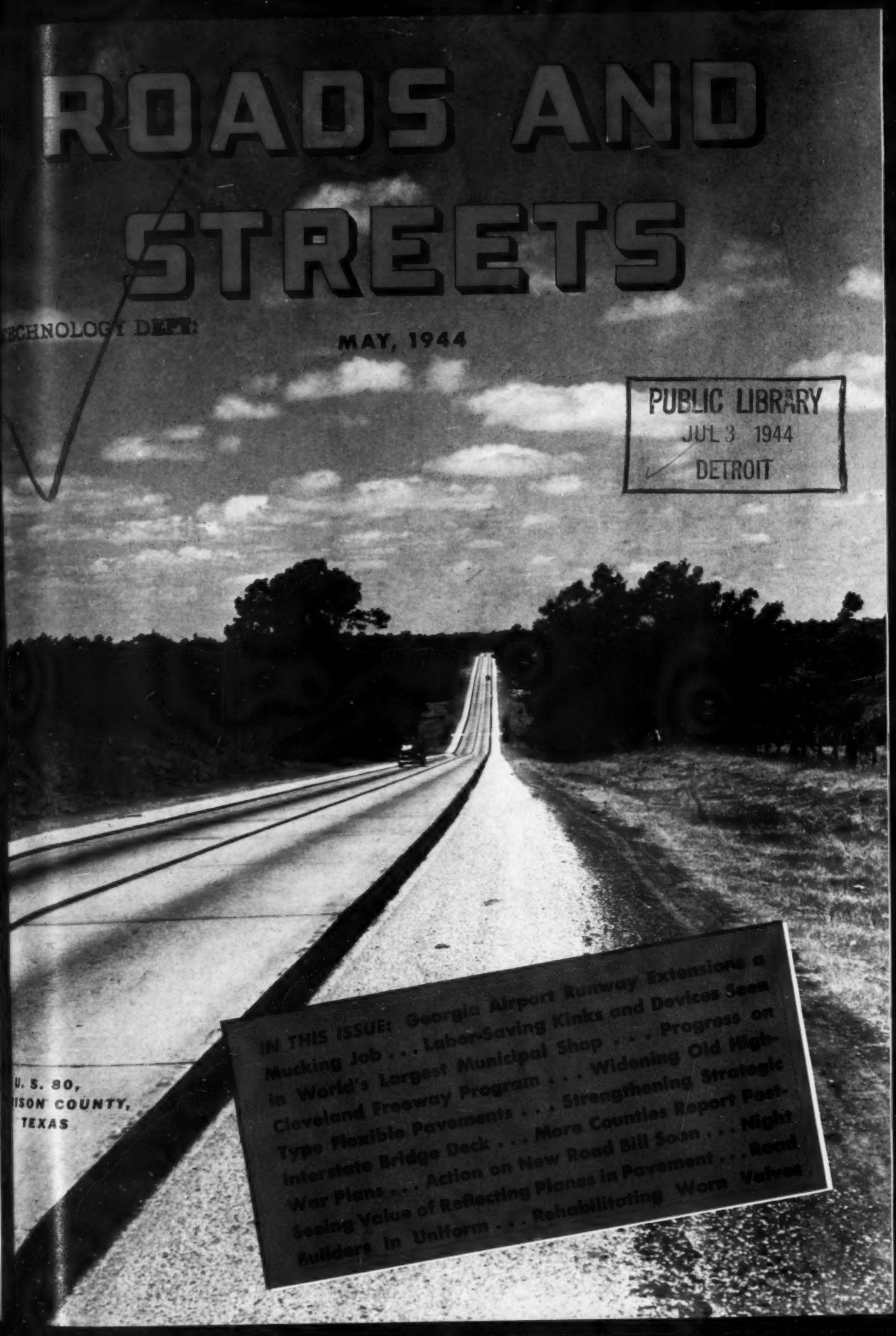
ROADS AND STREETS

MAY, 1944



U. S. 80,
ISON COUNTY,
TEXAS

IN THIS ISSUE: Georgia Airport Runway Extensions a Mucking Job . . . Labor-Saving Kinks and Devices Seen in World's Largest Municipal Shop . . . Progress on Cleveland Freeway Program . . . Widening Old High-Type Flexible Pavements . . . Strengthening Strategic Interstate Bridge Deck . . . More Counties Report Post-War Plans . . . Action on New Road Bill Soon . . . Night Seeing Value of Reflecting Planes in Pavement . . . Road Builders in Uniform . . . Rehabilitating Worn Valves

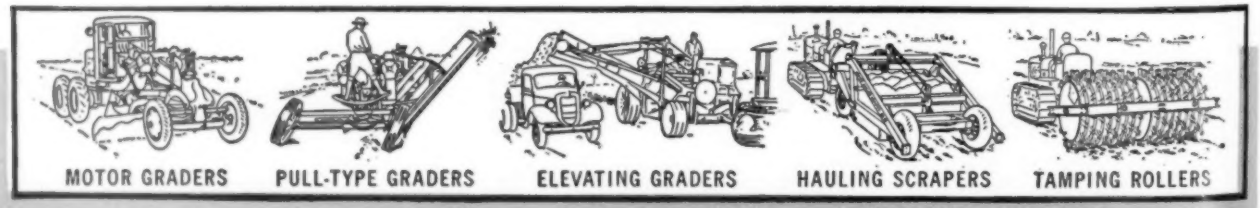
For concentrated fighting and high casualties, few battles in American history can approach Tarawa. Burrowed deeply into the earth, the Japs resisted fiercely the determined attacks of U. S. Marines. In the end the enemy were wiped out almost to the last man but only a few hundreds of the attacking force escaped death or injury.

Scarcely had the shooting stopped when Adams motor graders, in the hands of the Seabees, ran ashore to clear away the rubble left by the battle. Within a few days after the Marines landed, the motor graders had completed the air strip pictured above thus establishing another advance base from which our planes can operate.

This is just another example of how not only Adams motor graders, but Adams leaning wheel graders, elevating graders and tamping rollers are in the thick of the fight in the hands of the Army and Navy throughout the world—performing with characteristic dependability. While our brave sons and brothers carry the fight forward on foreign shores let us back them to the limit on the home front to hasten the day when they can return to their normal peacetime pursuits.

J. D. ADAMS COMPANY · INDIANAPOLIS, IND.

At war's end we'll need many new roads and many jobs for returning service men. Plan post war projects now and meet both needs.



ADAMS ☆ ROAD-BUILDING AND ☆ EARTH-MOVING EQUIPMENT

G. I. finds a friend

G. I. (as the Yank soldier prefers to call himself) has to handle a lot of wire rope these days. On landing barges . . . on cranes, hoists, and power shovels . . . and especially on trucks and tanks, most of which carry an emergency winch cable as standard equipment. For such uses, Bethlehem has supplied millions of feet of wire rope—much of it in our top-quality Form-Set (preformed) construction.

When a truck is mired, or when there's a heavy hauling job to be done, the G. I. winch cable is a friend in need. And when it's supple, easy-handling Form-Set it's doubly a friend. That means a lot to G. I., who as likely as not was a traveling salesman or grocery clerk in civilian life, and had no experience in handling wire rope.

Because its strands and wires are preformed in their corkscrew shape, Form-Set is free from locked-up constructional tensions. It's easy to splice and spool, requires no seizing, and sprouts no spiny wire bristles to slash the hands of men who work with it. All of which explains why Government agencies have bought it in such vast quantities for military operations.

You get the utmost in service and long life from Form-Set when it's in the Purple Strand grade. Purple Strand wire rope is made of strong, tough Improved Plow Steel, the highest-quality steel that's used in wire-rope construction.

In Form-Set Purple Strand you get the ideal combination of preformed ease of handling with the unmatched strength and ruggedness of Improved Plow Steel. Plan to order it for your next wire rope job, or for replacements. But make your plans, please, as far in advance as possible, so that you will be sure to have Form-Set Purple Strand Wire Rope when you need it.

Form-Set
Purple Strand
Wire Rope

★ ★ BETHLEHEM STEEL ★ ★

ROADS AND STREETS

Vol. 87, No. 5 • May, 1944

CCA

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

CONTENTS

THIS MONTH'S COVER

"This beautiful photo is one of many such scenes taken by M. B. Hodges, Maintenance Engineer of the Texas Highway Department."

Published Monthly by Gillette Publishing Co., 330 South Wells St., Chicago, Ill.; New York office, 155 E. 44th St.; Cleveland office, Leader Bldg.; Los Angeles office, 816 W. 5th St. Subscription price $3.00 per year in the United States, $3.60 per year in Canada, $4.00 per year for foreign mailing.

LARGEST "LOUDSPEAKER" IN ITALY

A Lorain Moto-Crane swings the barrel of a 240 mm. Howitzer into position for mounting, on the Cassino front.

— U. S. Signal Corps Photo from Acme

LORAINS were never meant to do jobs like these and we hope when this is over they'll never have to do them again.

Sure, they'll do jobs like this in topnotch style, but they're even better on the kind of jobs you'll be doing after the war. And because of their wartime experiences, improvements and developments, they'll be equipped better than ever to serve you profitably.

Right now is the time to find out about these better Lorains. Go to the Lorain distributor in your territory. He has the experience and the facilities to serve you well and wisely on all material handling equipment needs.

THE THEW SHOVEL COMPANY, Lorain, Ohio

Reg. Trade Mark

thew-Lorain MOTO-CRANES

CRANES • SHOVELS • DRAGLINES


Thirty-four NORTHWESTS for
When planning for the future, think this over and remember that for 20 years not less than 1 out of every 3 Northwests was a repeat order in the hands of the country's leading contractors.
These Associated Companies
Arundel Corporation
Consolidated Engineering Co., Inc.
Hardaway Contracting Co.
NORTHWEST ENGINEERING CO., 1732 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Ill.
NORTH WEST
and EVERY ONE a ROCK SHOVEL!
-and when you have a real Rock Shovel you won't have to worry about output in dirt

This is the Littleford 84-HD Kettle with Hand Spray Attachment. Models include the 84-HD Kettle with Motor Spray Attachment, the "One Man Kettle," or the 84-HD without Spraying Attachments.

84-HD
ROAD MAINTENANCE KETTLE

For Post War Highway, Road, Street, and Airport Runway Repairs, use an 84-HD Kettle. It has through actual service proven to be the most efficient operating Kettle of its kind. With a Hand Spray Attachment, the 84-HD Kettle becomes a two-man unit, one to turn the pump and the other to control the spray. The Continuous Heat Circulating Heat System and the Screened Reservoir make the 84-HD a low cost, fast heating, fast producing sprayer. There should be a Modern Littleford 84-HD Kettle in your plans for the future.

BLACK TOP ROAD MAINTENANCE EQUIPMENT · LB · SINCE · 1900

LITTLEFORD

LITTLEFORD BROS., INC.
454 E. Pearl St., Cincinnati, Ohio

Exhibit A...OF A VITAL POSTWAR JOB, EVERY COUNTY, U. S. A.

Cleaver-Brooks Portable Tank Car Heater—a high pressure, oil-fired, compact mobile heater, available in two and three tank car sizes.

Truck-mounted Cleaver-Brooks Portable Pumping Booster used in airport, flight strip, and road construction.

THE above picture could be that of any one of scores of American highways. Temporary patching and spot repairs may serve for the duration, but War's end will call for a nation-wide program of existing road reconstruction plus new highway projects.

Be ready—be competitively equipped—to get your full share of the work.

Time and cost-saving machines will enable you to handle more jobs with more profit . . . Write today for complete information on Cleaver-Brooks Tank Car Heaters and Bituminous Boosters. Get the complete facts on their high speed low cost performance—heating road oils and bituminous materials to application temperatures. Learn why the original and exclusive Cleaver-Brooks four pass down-draft flue travel and integral burner construction, plus the positive dry-coil method of condensate return, provides unsurpassed speed and economy. Cleaver-Brooks Tank Car Heaters are built in two and three tank car sizes—Portable Pumping Boosters in two capacity sizes, with truck mounting or 4-wheel trailer. Send for bulletins or see your Cleaver-Brooks distributor.

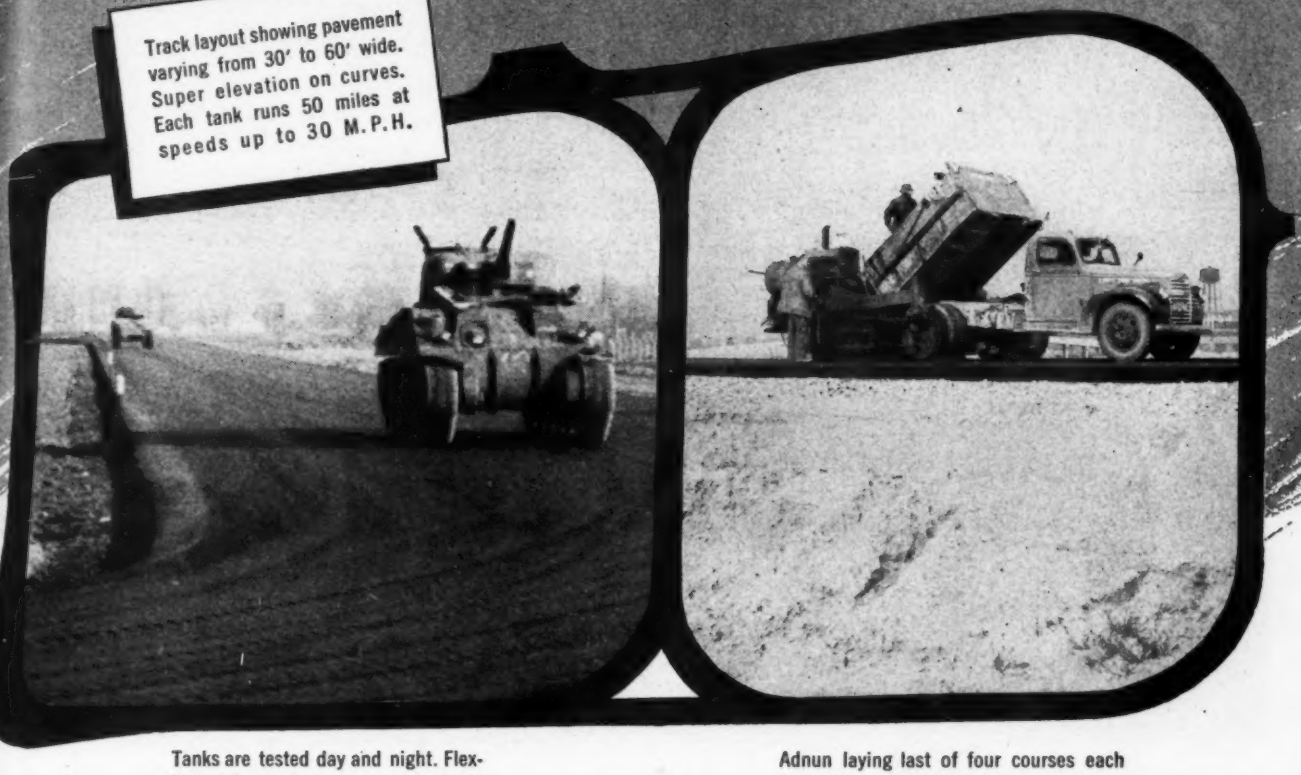
CLEAVER-BROOKS COMPANY, 5106 N. 33rd Street, Milwaukee 9, Wis.

Cleaver-Brooks

TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM PLANTS

ADNUNS LAY WORLD'S TOUGHEST TRACK

Track layout showing pavement varying from 30′ to 60′ wide. Super elevation on curves. Each tank runs 50 miles at speeds up to 30 M.P.H.



Tanks are tested day and night. Flexible bituminous pavement adjusts itself to heavy blows of treads without break in pavement.

Adnun laying last of four courses each 1½″ thick and 10′ wide on stabilized base. No forms needed. Parallel strips firmly compacted together.

Thirty-ton tanks, grinding their macerating way around and around the Chrysler testing track in Detroit, reduced to rubble all roads until one of asphaltic concrete was built last year. It has proved to be resilient and rugged enough to withstand the heavy blows of the treads without permitting a break in the pavement, standing up where all others failed.

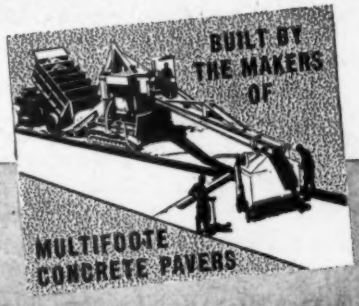
Two Adnun Pavers put down the 6-in. black top surface on this toughest of tracks—30,000 sq. yds. (9,000 tons) of hot-mix, hot-laid asphaltic concrete—in four courses of 1½ in. each. Results proved again the quality of Adnun work—maximum density, tight joints between strips, smoothest finished surface, all-weather durability against either rubber-shod or steel-shod treads. Adnun Black Top Pavers were the first in the field. They are the first in performance today. Continuous Course Correction, an exclusive Adnun feature, makes it possible to lay each course more smoothly than the preceding one. This gives better material control and insures maximum density in the pavement. Overlapping action at the Cutter Bar assures a tight joint at the curb or against the paralleled course, thus making forms unnecessary.

Send for the new catalog describing the newest features that make Adnuns more usable and productive than ever. Learn how the Power Cut-Off and Hydraulic Control insure higher production by providing fatigueless operation.

Write today. No obligation.

THE FOOTE COMPANY, INC., NUNDA, N. Y.

The World's Largest Exclusive Manufacturers of Concrete and Black Top Pavers



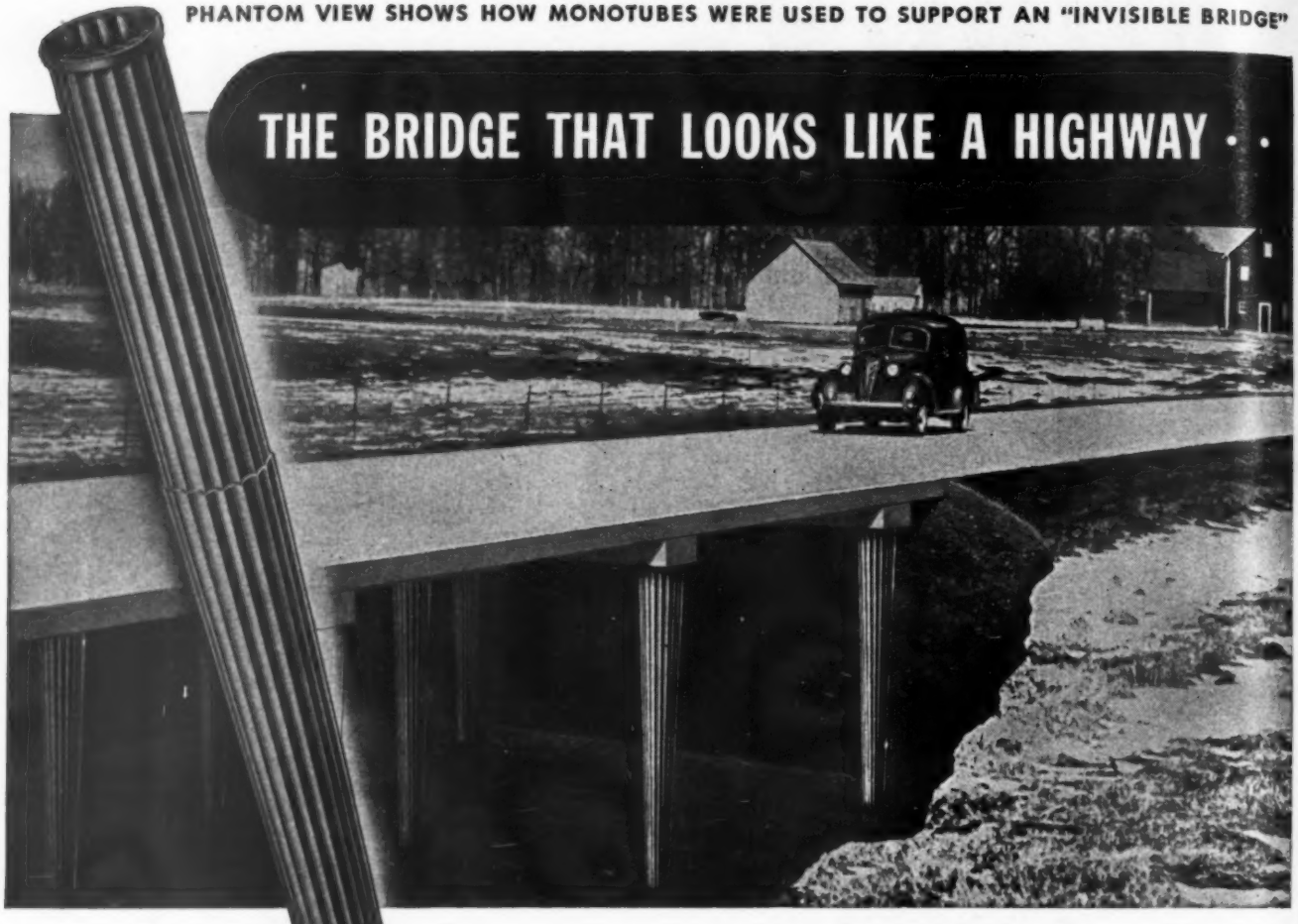
ADNUN

TRADE MARK REGISTERED

BLACK TOP PAVER

WITH CONTINUOUS COURSE CORRECTION

PHANTOM VIEW SHOWS HOW MONOTUBES WERE USED TO SUPPORT AN "INVISIBLE BRIDGE"



Contractor: Gradle Brothers, Inc., Carmel, Ind. Engineer: Paul Sawyer.

· · Built on Extendible Monotubes

Detail showing how Monotubes are extended in the field to make possible the installation of varying pile lengths quickly and economically.

TO the casual observer, there is nothing unusual about the stretch of highway pictured above. But to the engineers and contractors who built it, here is a very unique project.

On U. S. Highway 31, near Kokomo, Indiana, a troublesome muck pocket condition exists that is much too soft to support an ordinary concrete road. Indiana State Highway Commission's answer to the problem was to drive Union Metal tapered steel Monotubes to refusal at 20 to 65 ft. depths. These Monotubes were then filled with concrete, and capped, and bridge slabs were built directly on the fill. Result: an invisible bridge consisting of 32 spans and stretching for 583 feet . . . a highway that will not break up or sink, a highway that will last for years without costly repairs.

The ease with which Monotubes can be driven and extended to meet varying depth requirements without delay or waste, contributed in a large measure to the success of this achievement.

Tapered, all-steel Monotubes are light yet sturdy—easy to handle and drive, simple to inspect. And they are available in a gauge, size, and taper to meet the most exacting requirements in any soil condition. Write for your free copy of the Monotube Catalog 68A to The Union Metal Mfg. Co., Canton 5, Ohio.

UNION METAL

Monotube Pile Casings

HERE'S PROFITABLE PLANNING HELP FOR YOU

. . STUDY THIS CHART . . SEE WHERE LeTOURNEAU EQUIPMENT CAN HELP YOU MAKE MONEY ON EARTHMOVING AND MATERIALS HANDLING

LeTourneau rigs have literally hundreds of profitable uses. To help you determine where they fit into your work, we've developed this chart of major and secondary applications. Study it. If you're not using LeTourneau rigs on the checked applications (every one proved practical by actual use), see your LeTourneau dealer.

★ MAJOR APPLICATIONS
● SECONDARY APPLICATIONS

	CONSTRUCTION										GOVERNMENTAL			RAILROADS			INDUSTRY	
	EARTHMOVING	BRIDGE	PAVING	HIGHWAY	LEVEE	BUILDING	PIPE LINE	FEDERAL	STATE	COUNTY	TOWNSHIP	CITIES	CONSTRUCTION	MAINTENANCE	OPERATION	FACTORIES	DOCKS & WHARFS	COAL HANDLING
SUPER C TOURNAPULL** (Capacity-15 heaped yards)	★		●	★	★			★	★	★		●	★					★
SUPER C TOURNACRANE** (Lifting Capacities up to 20,000 lbs.)	●	●	●	★		★	★	★	●	●		●	●	●	★	●		
SUPER C TOURNATRAILER** (Capacity-17 heaped yards)	★		●	★	★	●	●	★					●					★
MODEL D TOURNAPULL† (Capacity-2.3 heaped yards)	●		★	●				★	★	★	★	★	★	★				●
MODEL D TOURNACRANE† (Lifting Capacities up to 10,000 lbs.)			★	●		★	●	★	●	★	★	★	●	●	★	★	★	
MODEL D TOURNATRUCK† (Capacities-5 tons)	●		★	●		★	●	★		★	★	★	●		●	★	★	
POWER CONTROL UNITS (for all "Caterpillar" tractors; Allis-Chalmers L, L-O, HD-10, HD14, S, SO; International TD40, TD18, TD14, Cletrac FD, FG, DD, DG, CG)	★	★	★	★	★	●	★	★	★	★	★		★	★	★	★	★	★
CARRYALL SCRAPERS (for all tractors fitted with PCU's)	★	●	●	★	★	★		★	★	★	★	●	★	★				★
ROOTERS (for all tractors fitted with PCU's)	★			★	★		●	★	★	★	●		★	●				
TRACTOR CRANES (for all tractors fitted with PCU's)	●	★	●	●		★	★	★	●	●		●	●	●	★	★	★	
DOZERS (for all "Caterpillar" tractors)	★	★	★	★	★	●	★	★	★	★	●	●	★	★	★	●		●
SHEEP'S FOOT ROLLERS (for all tractors)	★		★	★	★			★	★	★			★					

Don't take a chance of going into the "red" with slow, out-dated equipment on your postwar projects. Ask your LeTourneau dealer how the rubber-tired power of Tournapulls and the big capacity of LeTourneau rigs can get your jobs done faster and put more money in your pocket. See him NOW.

**15-yd. Carryall Scraper, 17-yd. Tournatrailer and Tournacrane (20,000 lb. lifting capacity) interchangeable on same Super C Tournapull prime mover.

† 2.3-yd. Carryall Scraper, Tournacranes (4,000 to 10,000 lbs. lifting capacities) and 5-ton Tournatruck interchangeable on same Model D Tournapull prime mover.

LETOURNEAU

PEORIA, ILLINOIS : STOCKTON, CALIFORNIA

LeTOURNEAU (Aust.) Pty. Ltd., Rydalmere, New South Wales, Australia.

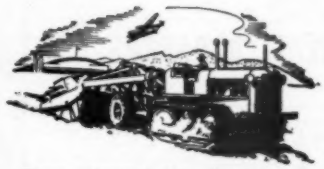
POWER TO WAGE WAR AND TO SERVE PEACE

FROM the very beginning, GM Diesels have been tested in the crucible of war. They power tanks, heavy gun tractors and bulldozers; submarines and subchasers; invasion boats and lighters. And everywhere, always, these weapons are proving worthy of the fine fighting men who are using them.

That is because GM Diesel operation is based on simple and sound mechanical principles. GM Diesel construction is exceptionally strong and uniformly precise—the way General Motors always builds.

When normal life and living are resumed, GM Diesels will be as ready to step back into private life and resume service in peace as they were to go to war. And you will find them as capable of sure, reliable, low-cost performance on the toughest jobs at home as they are on fighting fronts the world over.

Tomorrow



Reconstruction and new construction are going to need plenty of this hard-hitting, easy-on-the-fuel power. With normal refinement and development speeded up by war, with production expanded, GM Diesels will be ready to serve in more fields and in more ways than ever.

GM
GENERAL MOTORS
DIESEL POWER

ENGINES..15 to 250 H.P...**DETROIT DIESEL ENGINE DIVISION,** Detroit, Mich.

ENGINES...150 to 2000 H.P.....CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

LOCOMOTIVES.....ELECTRO-MOTIVE DIVISION, La Grange, Ill.

Still PUSHIN'

SIGNAL CORPS PHOTO

They're going big over there as they did over here! The same 2-cycle Diesel tractors that helped rush through the huge home front construction program the last few years are showing they still have plenty of service left . . . are now handling and licking even more difficult work for the Armed Forces overseas.

After tough day and night shifts on the big ordnance jobs here, they were put in tip-top operating condition in a hurry and shipped to distant areas of activity. Much of the overhauling was handled by Allis-Chalmers dealers whose skill, proper tools and genuine parts made A-1 repairs a certainty.

Now is the time to plan your future dirt-moving methods. Now is the time to investigate 2-cycle Diesel power . . . see what it will do for you! Why not talk it over with your Allis-Chalmers dealer! Write for literature.

During the days of action here, 2-cycle Diesel tractors in great numbers helped lay the groundwork for the Arsenal of Democracy.

Now in active theaters of the war, the same 2-cycle Diesel tractors help prepare the bases and airfields for use against the enemy.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

2-CYCLE THE MODERN DIESEL POWER

★ ON THE WARPATH! ★

EVERY U. S. HIGHWAY, every street and country road—wherever hauling has had to keep step with fast-moving war construction—has been converted into a warpath by trucks.

Fast, dependable trucks—working long hours under heavy loads, often in the toughest kind of going—have moved mountains of material, *on time.*

A good share of the trucks on America's construction warpaths are Internationals. Performance made them the largest-selling heavy-duty trucks on the market. And the same toughness, dependability and economy of operation that put them out in front in days of peace keep them there in these days of war.

It's a big job trucks are doing—a job that *must* be done. That means your trucks must be maintained, must be kept in tip-top shape. International civilian truck service—the nation's largest company-owned truck service organization—is now a *wartime* truck service . . . more alert, more efficient than ever.

No matter what your make or model of truck, let International Service keep your trucks rolling on the warpath for Victory!

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

NEW TRUCKS—*Limited!*

The government has authorized the manufacture of a limited quantity of trucks for civilian hauling in essential occupations. For your new truck, see your International Dealer or Branch right away. Don't delay!

BUY BONDS··BUY MORE BONDS

INTERNATIONAL *Trucks*

Actual performance records kept by N. M. Ball & Sons, General Contractors of Berkeley, Calif., prove that Velvetouch wears, on an average, three times longer than any other type friction material they have used.

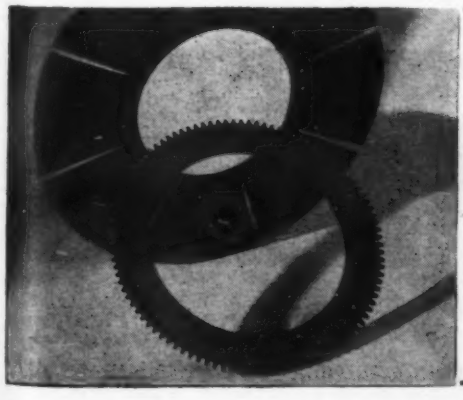
As a result, they have installed Velvetouch Bimetallic linings and facings on 90% of their earth-moving equipment, consisting of D-8 Caterpillar Tractors, Road Graders, Rollers, Le Tourneau Power Units, etc.

Mr. W. D. Sorenson, Sup't., Tractor Equipment, writes: "Velvetouch is all you claim it to be. We have tested it in our severest operations, and it has proven the best material we have ever used . . . cuts lay-up time and replacement costs to a minimum."

VELVETOUCH IS ALL METAL . . .
made entirely from compressed powdered metals, welded to solid steel backing plates. Because it is all metal, Velvetouch wears longer . . . requires less adjustment . . . is little affected by oil or water.

For complete details write to:

THE S. K. WELLMAN CO.
1374 EAST 51st ST. • CLEVELAND 3, OHIO



FOR BRAKE AND CLUTCH
USE Velvetouch
BIMETALLIC FRICTION MATERIAL—TRADE MARK REGISTERED

NOW is the time to Select Equipment for Next Winter's Snow Removal

Experienced highway maintenance men know that you can't put snow removal into a neat package in early Spring and label it "Do not open until Fall"!

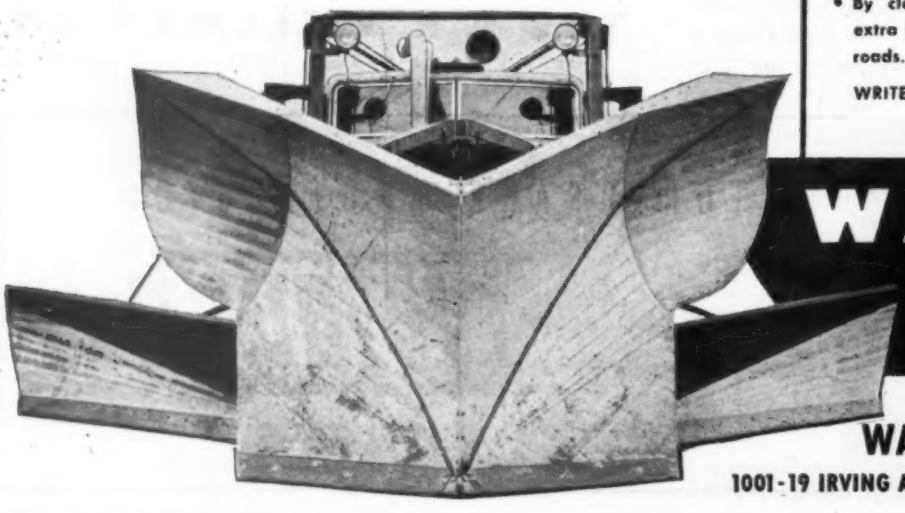
They know that many phases of snow removal are best planned in the off-season, when the past winter's experience can be studied—operating techniques re-examined—equipment checked. Above all, they realize that specialized snow removal equipment — vital to winter highway maintenance — must be evaluated, ordered and produced *months before the first snow falls.*

It's easy (and often too late) to recognize the dangers of traffic tie-ups when snow is piled deep on your highways. But it's a lot safer to take steps NOW to insure readiness for the severest conditions next winter.

Important Advantages of WALTER 250 H. P. SNOW FIGHTER

- Clears a 28 ft. width in one run—has rugged power to smash through road-blocking drifts, plus speed to clear more miles per hour.
- Throws snow far to the side—makes widening-out easier.
- Does not waste power in slipping, stalling or wheel-spinning, because the exclusive Walter 4-Point Positive Drive delivers power to each of FOUR driving wheels according to its traction at any instant.
- By clearing main highways faster, you gain extra time for opening more miles of secondary roads.

WRITE TODAY for detailed literature.



WALTER
SNOW FIGHTERS

WALTER MOTOR TRUCK CO.
1001-19 IRVING AVE., RIDGEWOOD 27, QUEENS, L. I., N. Y.

AMERICA IS *Built with Aggregate!*

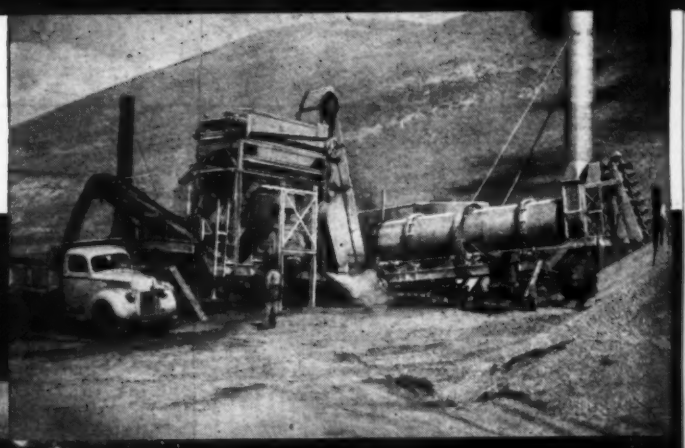


Photo by Ewing Galloway

HIGHWAYS TO THE SKY!

To the global airlines, highways to the sky are runways that are safe, smooth, permanent, and have tremendous load-carrying capacity. The engineer and contractor see them as aggregate at so many cents per yard. And, that price has to be the lowest possible.

Refinements in crushing equipment are lowering production costs despite increasingly strict specifications. Such improvements are the result of American free enterprise which developed the line of Cedarapids plants.

When you have a contract to build tomorrow's HIGHWAYS TO THE SKY, use aggregates produced by Cedarapids crushing plants. All sizes and types available. You'll get better results and it will cost you less.

Remember it's Iowa — headquarters for Aggregate Producing Equipment!

IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA

Cedarapids
Built by IOWA

THE IOWA LINE

of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS — STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS — TRAPS
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

WARD LaFRANCE TRUCK DIVISION

GREAT AMERICAN INDUSTRIES, INC.

ELMIRA NEW YORK

MEMORANDUM TO THE ADVERTISING AGENCY

FROM: A. Ward LaFrance, Vice President
Great American Industries, Inc.

SUBJECT: POSTWAR WARD LA FRANCE TRUCKS FOR FLEET OWNERS

As you know, there are some interesting, perhaps revolutionary, ideas under development here at our Elmira plant, and I know you can't wait to tell prospective users about them. That is understandable. But please keep this clearly in mind:

Motor truck fleet owners are practical people. They are badly in need of replacement vehicles, and they are interested in the proved ideas which can be incorporated in trucks available just as soon as manufacturers can return to civilian production. We have some fundamentally important things to tell these gentlemen, so let's not waste paper on gaudy promises and fanciful pictures of beautiful, streamlined dreams of postwar models.

Let's try to get the fact across that Ward LaFrance trucks have a twenty-five-year reputation for being good trucks. Let's admit frankly that Army Ordnance engineers have increased our know-how and made it possible for us to build still better ones after the last M-1 Heavy Wrecker has been delivered.

Fleet owners should be particularly interested in our new policy of concentration on their needs. This is of great importance because it will enable us to engineer and build vehicles to their exact needs. Fleet owners will recognize that this policy will result in a truck which will out-perform and outlive standard production models in a great majority of cases. Chances are, however, people will assume such trucks will cost too much. If you people in the agency can persuade fleet owners to get the facts from our engineering staff, that is all we ask of you. We can demonstrate clearly the fundamental economy of the new Ward LaFrance policy to any fleet owner's satisfaction.

A. Ward LaFrance.

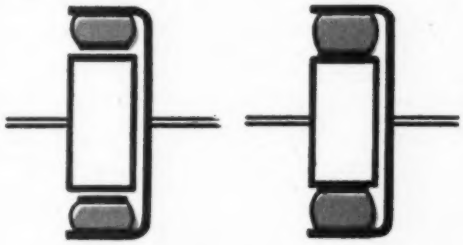
GREAT AMERICAN INDUSTRIES, INC., GENERAL OFFICES, MERIDEN, CONNECTICUT

DIVISIONS

CONNECTICUT TELEPHONE & ELECTRIC DIVISION, MERIDEN, CONNECTICUT
WARD LaFRANCE TRUCK DIVISION, ELMIRA, N. Y.—FACTORY BRANCH, 139TH ST. & EASTERN BLVD., NEW YORK
VIRGINIA RUBATEX DIVISION, BEDFORD, VIRGINIA
RUTLAND ELECTRIC PRODUCTS DIVISION, RUTLAND, VERMONT

The Only Heavy Duty Clutch with these 12 Advantages

No levers, no arms, no toggles, no springs! Nothing to adjust, nothing to lubricate! Low maintenance cost—long wear! Clutch action as light, or as firm, as you want it. Performance proved in the toughest kind of naval service, and on hundreds of heavy machinery applications.



It works like this

Rubber and fabric air gland, on drive member, rolls free of the driven member. Compact, and free from mechanical complications.

Inflate gland—clutch engaged. Deflate gland—clutch disengaged. Torque entirely controlled by air pressure—vibration and shock absorbed.

1. Simple in design and operation
2. Flexible control by air
3. No adjustments or oiling—low maintenance
4. Dampens vibration—absorbs shocks
5. Corrects misalignment automatically
6. Smooth starting—no jerks
7. Runs cooler—uniform pressure
8. Controls torque by air pressure
9. Greater capacity—more compact
10. Remote control by air valve
11. Replaces flexible couplings
12. Acts as clutch, slip-clutch, brake and coupling.

For Cranes, Drags and Dredges

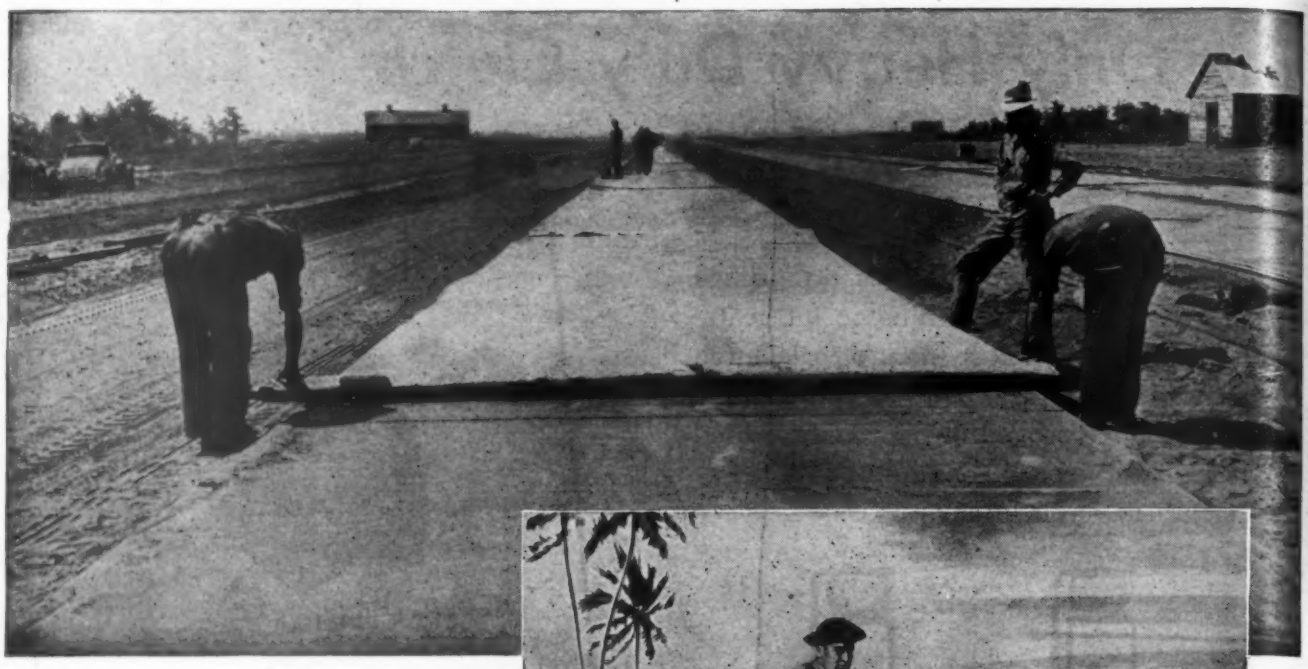
Fawick Engineering Department will gladly give you detailed information on special applications, to meet your operating conditions.

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. Cleveland 11, Ohio

In Canada, Renold-Coventry Ltd., Montreal, Toronto, Vancouver
In Britain, Crofts Engineers, Ltd., Bradford, England

FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR



SISALKRAFT

Cured Runways for Flight . . . Protects Supplies for the Fight!

After 96 hours of curing under SISALKRAFT blankets in the hottest part of July, the concrete in these air-field runways was still damp. SISALKRAFT has done a dependable peacetime job in protecting newly poured concrete in all kinds of weather.

Because of the toughness and weatherproof qualities that have made SISALKRAFT the preferred concrete curing agent, this scuff-proof, tear-resistant material now protects war supplies from ice, sleet, snow, salt water, wind and dirt.

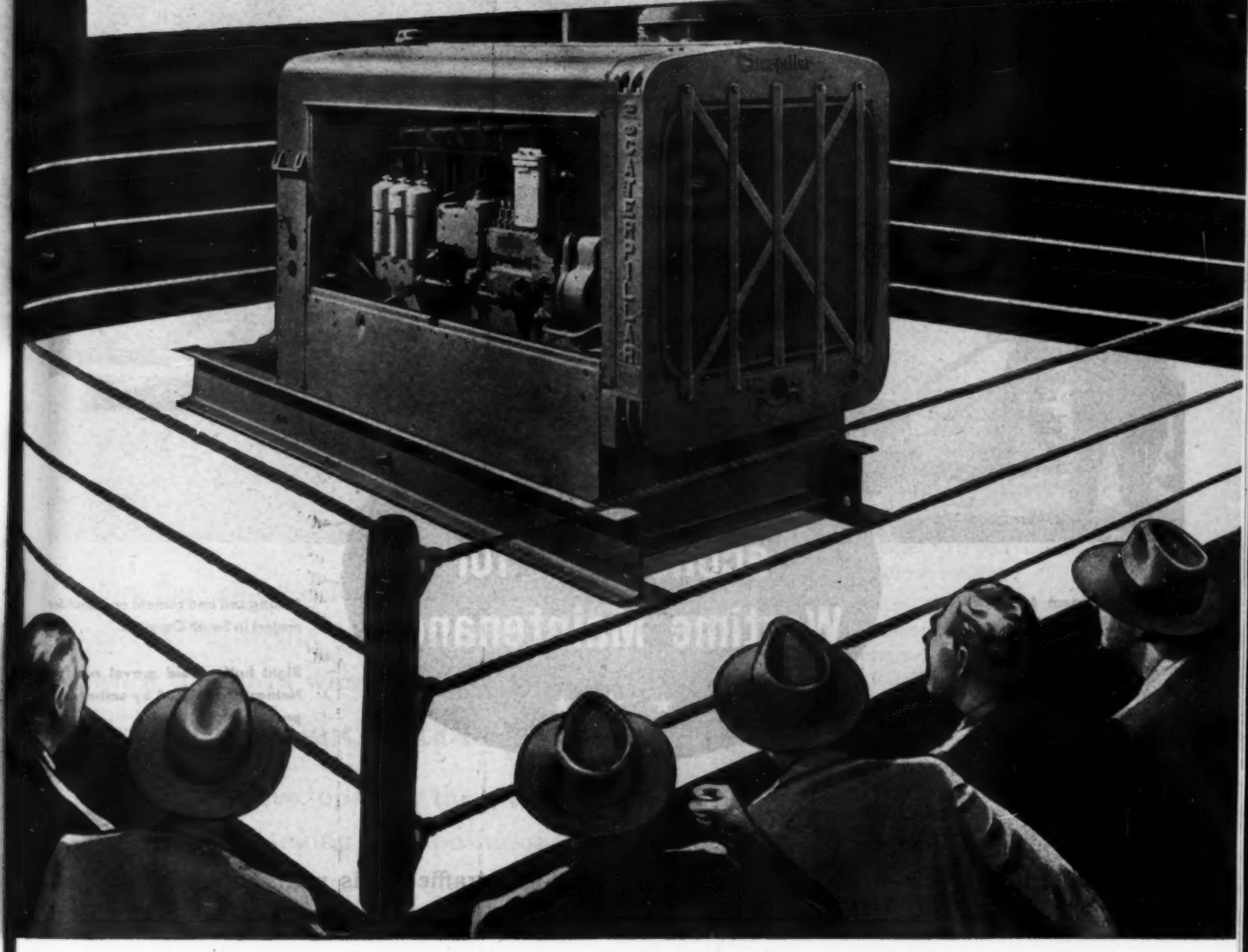
Directly exposed to ice and extreme cold and to tropical heat and moisture, SISALKRAFT is setting new records for endurance and dependability far beyond normal expectancy.

When Victory is won, SISALKRAFT will again be available to protect newly poured concrete, for general job protection and to cover machinery and materials stored in the open. Its amazing war record is convincing proof of its outstanding toughness and weatherproof qualities.

THE SISALKRAFT CO.
205 W. WACKER DRIVE · CHICAGO 6, ILL.
NEW YORK · SAN FRANCISCO · LONDON · SYDNEY

Manufacturers of SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

BARE-KNUCKLE CHAMPION



THE "Caterpillar" Diesel Engine is all-time bare-knuckle champion in its class. It packs more power and can take more punishment than any other heavy-duty engine of its size.

No other Diesel built can match the simplicity of this engine — important now, when skilled operators are scarce. It's as nearly fool-proof as an engine can be made. There are only three simple operating adjustments—valves, fan-belt and water pump.

From fan to flywheel, the whole engine is "Caterpillar"-built. The fuel system is typical of sound "Caterpillar" design and construction. It requires no adjustments whatever. It can burn any type of fuel that's handy, from cleaned crude oil out of a pipeline to high-octane gasoline. And its fuel economy is famous the world over.

"Caterpillar" Diesel Engines are built for full-load, full-time work — for more productive hours on the job and longer life. They have positive protection against dust, mud and water.

Ease of servicing is a big factor in their favor. Every part that is subject to wear can be replaced with a minimum of labor and expense.

Because "Caterpillar" Diesel Engines are used to power so many different types of equipment — such as excavators, compressors, crushers, locomotives, gravel plants and rollers — it is possible to standardize on them and thus reduce service and operating costs. And they can be hooked up in multiple installations with no loss in efficiency and definite advantages in work output.

Right now, "Caterpillar" Diesels are contributing millions of rugged horsepower to winning the war. With the coming of victory, our full production will once more be available for peacetime jobs. In the meantime, your "Caterpillar" dealer is fully equipped to keep your present machines in running order. Call on him for counsel and service. And if you are qualified to get a new "Caterpillar" Diesel, he will explain how you can apply for it.

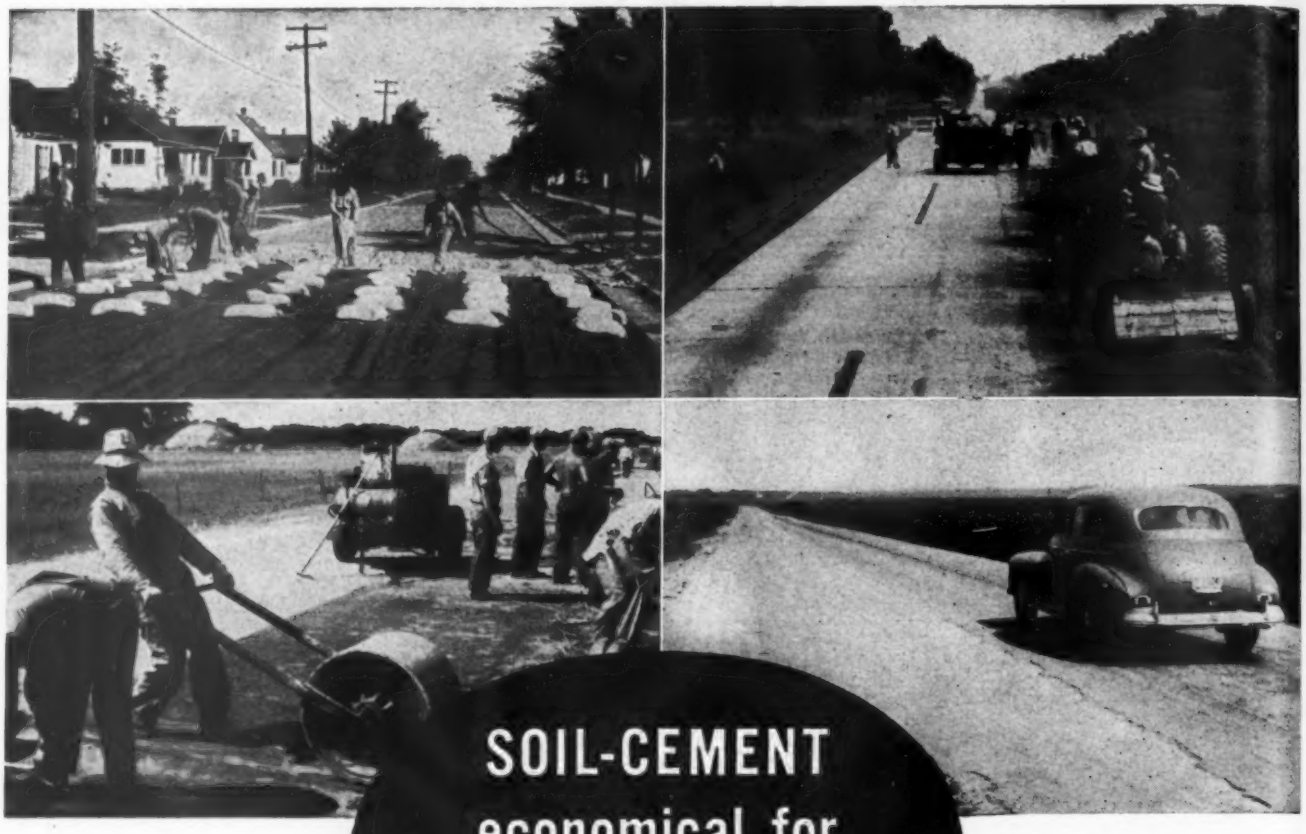
• • •

CATERPILLAR TRACTOR CO., PEORIA, ILL.

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!



SOIL-CEMENT economical for Wartime Maintenance

★ ★ ★

Spreading cement for salvaging old gravel street in Wisconsin.

Putting finishing touches to newly compacted soil-cement patch which soon will carry traffic.

Mixing soil and cement on shoulder project in South Carolina.

Right half of old gravel road in Nebraska salvaged by soil-cement process.

Soil-cement is meeting the requirements of rigid economy essential to wartime reconstruction, maintenance and shoulder work on old roads and streets carrying light traffic.

Rundown sections of secondary or intermediate highways and streets needed for wartime traffic can be salvaged and restored to usefulness by processing the failed areas with soil-cement, using available maintenance machinery.

Light traffic roads which are now dangerously narrow can easily be widened with soil-cement shoulders.

Patch maintenance too is simple with soil-cement. Patches made with soil-cement "stay put."

Four-page illustrated data sheet (No. SCB-6) based on field experience will be mailed free to aid engineers in wartime reconstruction and maintenance operations with soil-cement.

PORTLAND CEMENT ASSOCIATION, Dept. 5-28, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

BUY MORE WAR BONDS

$$\left(\frac{YOUR}{TRUCK}\right)+\left(\frac{ST.\ PAUL}{PATROL}\right)=\frac{GOOD}{ROADS}$$

Any four wheel drive truck makes a speedy, powerful road maintainer when combined with the

ST. PAUL HYDRAULIC TRUCK PATROL

Cab controls give operator the greatest speed in changing blade positions. Downward pressure on the moldboard is applied through two hydraulic rams. Cutting smoothness is assured by St. Paul's patented LEVELIZER.

Normal uses of truck are unimpaired.

For detailed literature and specifications please write the factory.

ST. PAUL HYDRAULIC HOIST COMPANY
2207 UNIVERSITY AVENUE S. E.
MINNEAPOLIS 14, MINNESOTA

PROTECT *Small* DIESELS THAT DO *Big* JOBS

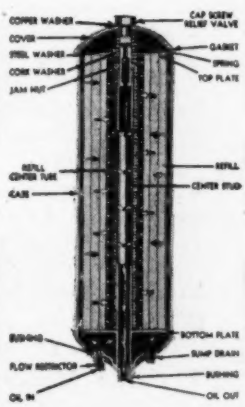
WITH THE BRIGGS G-800 LUBE OIL CLARIFIER

Don't forget that the lube oil in your under 35 H.P. Diesel engines needs proper protection if you want top-notch efficiency, more hours of uninterrupted service at minimum operating costs.

The Briggs G-800 Lube Oil Clarifier is designed for Diesel engines within this range. Two types of refills are available. If you use a straight oil—use the refill that incorporates the Patented Moulded Fullers Earth Block . . . the refill that ABsorbs the visible impurities and ADsorbs the invisible impurities that cause sludge and corrosion. If you use an additive type oil—use the all-cellulose refill.

Get the facts about the positive protection that Briggs G-800 Lube Oil Clarifiers will give your small but important Diesel engines. See or call the Briggs representative in your locality.

The Briggs G-800 Lube Oil Clarifier. Sturdily constructed. Easy to install and service. Supplied with heavy gauge adjustable mounting brackets and one refill. Actual size—height 23-3/4", dia. 6-1/16".



How the oil is filtered through the Briggs G-800. The oil first passes through cellulose, then through the Patented Moulded Fullers Earth Block, then again through cellulose. Your oil is "refinery pure" after passing through a Briggs.

Briggs

PIONEERS IN MODERN OIL FILTRATION

BRIGGS CLARIFIER COMPANY
1339 WISCONSIN AVENUE, N.W. • WASHINGTON 7, D. C.
Representatives in Principal Cities

CONCRETE HIGHWAY NEWS

Universal Atlas Cement Company (United States Steel Corporation Subsidiary)
Chrysler Building, New York 17, N. Y.

OFFICES: New York, Chicago, Albany, Boston, Philadelphia, Pittsburgh, Minneapolis, Duluth, Cleveland, St. Louis, Kansas City, Des Moines, Birmingham, Waco

PENNSYLVANIA ADDS MORE MILES OF WHITE CONCRETE REFLECTING CURB

PAVEMENT SCALING SOLVED

Tests prove scale-resistance of Atlas Duraplastic air-entraining portland cement

PAVEMENTS made with Atlas *Duraplastic*, which are practically scale-free after more than four years of street and highway service, have proved the value of Universal Atlas original research which developed Atlas *Duraplastic* air-entraining portland cement.

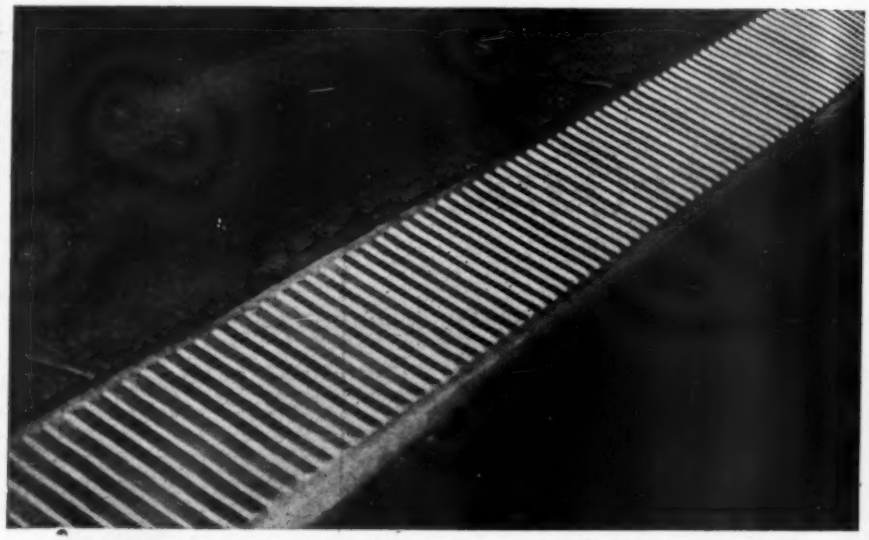
Quick Facts about Atlas Duraplastic

1. Complies with current Federal and A.S.T.M. specifications.
2. Renders concrete pavements highly resistant to scaling due to the action of salts used for ice removal.
3. Protects concrete against the effects of freezing and thawing weather.
4. Minimizes segregation and bleeding. Concrete is more uniform throughout and more durable.
5. Permits earlier finishing.
6. Requires no additional materials at the mixer.
7. Called *Duraplastic* because it makes concrete more *durable* and more *plastic*.

Our Technical Service Bureau will be glad to send you detailed information on Atlas Duraplastic, a product backed by more than six years of research and tests. Ask for reprints from trade and technical magazines which report the original research and the results of actual installations.

RS-CD-1

Night driving hazards reduced with ATLAS WHITE CEMENT



White Concrete Reflecting Curb on Essington Avenue, Philadelphia. General Contractor, Union Paving Co., Philadelphia; Curb Contractor, Frapaul Construction Co. Inc., Hackensack, N. J. Part of 62,000 feet of White Concrete Reflecting Curb now in place or under contract. 70,600 additional feet planned for early installation. Car headlights alone illuminate the curb in this picture, showing how it forms a white guide to safety for night driving.

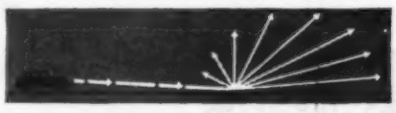
To cut down hazards of night driving—especially on rainy nights when visibility is almost nil—Pennsylvania is adding miles of White Concrete Reflecting Curb on important highways.

This Curb, made with Atlas White cement, is an effective safety measure for two reasons: it is a good reflector because it is white; it is highly visible because its scientifically designed projecting faces catch headlight beams and reflect them in the right direction—back to the driver's eyes. The diagrams below show why.

Rain actually increases the curb's reflective value, for a water film turns the reflecting faces into even better "mirrors" that show the way far ahead.

Before planning new highways or improving present ones, write to our Atlas White Bureau for full information on White Concrete Reflecting Curb. Ask for a copy of the book, "A White Guide to Safety."

A smooth curb (left) wastes light . . . reflects it up and away from the driver. A White Concrete Reflecting Curb (right) conserves light . . . reflects it back to the driver. A smooth curb is barely visible at night; a White Concrete Reflecting Curb stands out—bright and clear.



UNIVERSAL ATLAS CEMENTS

UNIVERSAL PORTLAND · ATLAS PORTLAND · ATLAS WHITE · ATLAS DURAPLASTIC · ATLAS HIGH-EARLY

BASIC DESIGN ASSURES STEERING EXCELLENCE...LONG SERVICE

GEMMER STEERING

Note the basic design of the Gemmer Steering Gear. An hourglass worm engages gear teeth that *roll*. Anti-friction bearings are placed at all critical points. Absence of sliding friction provides highest efficiency—easiest transfer of power—easy steering with plenty of power for parking.

Design and construction are also exceptionally sturdy and compact—providing abundant strength, long endurance—ease of installation—saving of weight without sacrifice of overall capacity or steering arm angularity. Alloy steel forgings provide ample safety factor. Internal stresses are low.

A Gemmer Steering Gear will last, and *give satisfaction* for the life of the vehicle.

Simple:—Just a few parts—nothing complex—nothing to get out of order or require frequent adjustment.

Stable:—No "lost motion"—wear reduced to least possible minimum. Steering is always firm, responsive, positive with absence of rubbery feeling and—wander.

Gemmer Steering is demonstrating its worth in every type of automotive vehicle from the lightest passenger cars to the heaviest buses and trucks—in the road-building machinery, agricultural tractor, and marine fields.

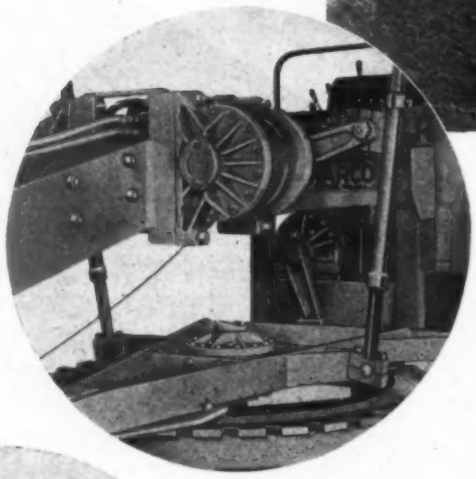
GEMMER
MANUFACTURING COMPANY
6400 MT. ELLIOTT
DETROIT 11, MICH.

GEMMER . . . Pioneer of Efficient Steering

WARCO

The finest in road machinery since 1922

All operations of the heavy blade are controlled by four hydromotors, through finger-tip pressure on control levers.



WARCO HYDROMOTOR CONTROLLED MOTOR GRADERS operate with effortless ease and positive control. Constructed for maximum visibility, machines permit operator to see all parts when grading, bank-sloping or ditching. Traction is powerful and dependable in extreme conditions. From sturdy front end to tandem rear, "WARCOS have what it takes".

WARCO-DUPLEX HYDRAULIC SCOOPS—famous for simplicity of operation, due to the absence of cables and other complicated attachments.

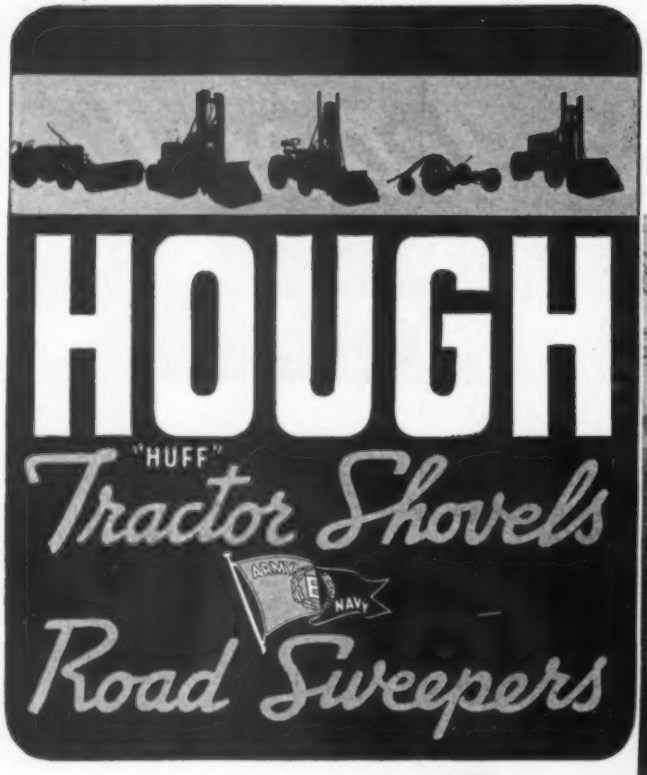
Above — Uncomplicated hook-up of scoop to hydraulic pump insures speed and eeconomy. The heavy front end has complete rotation.

Below—A simple hydraulic control unit controls all operations of the scoop.

WARCO-DUPLEX HYDRAULIC SCOOPS load faster with minimum power, assuring a good, full load in any type soil. All operations are controlled by one lever in the hand of the operator. No cables or gadgets to wear or connect —no overhead construction to prevent shovel or bin loading. Two large hydraulic rams do all the work. Simplicity insures economical operation.

ROLLERS — LIGHT PATROL MAINTAINERS — MULTIPLE BLADE MAINTAINERS — TERRACERS — ROTARY SCRAPERS

W. A. RIDDELL CORPORATION, Bucyrus, Ohio



Smooth

Operation-

a Feature of

Hough Cable-Operated Tractor Shovels

which imparts Speedier Handling, Greater Yardage and Lower Costs

Smooth, easy operation, made possible by proper weight distribution and sound engineering design, is a valuable characteristic of Hough Cable-Operated Tractor Shovels on International T-6, TD-6, T-9 and TD-9 Tractors. Owners report that operators have confidence in their machines, and have a welcome tendency to speed up the work, resulting in more material moved at a lower cost per yard.

Specifications include: automotive type main drive from engine crankshaft through hardened steel gears and propeller shaft equipped with universal joint; control lever raises, holds and lowers bucket; safety stop prevents overwinding cables; dumping clearance 7′; raising time of loaded bucket 9 seconds; lowering time only 2 seconds. Bucket capacity for T-9 and TD-9, ¾ yd.; for T-6 and TD-6, ½ yd.

Shipped completely mounted—ready for operation. Ask your International dealer or write for bulletin.

Can be converted to Bulldozer in less than 10 Minutes

The bucket can be readily removed and a bulldozer blade attached. Both straight and reversible blades are available. Blades are equipped with hardened reversible cutting edges. Mushroom type grading shoes are standard equipment. Blades can be quickly set for bulldozing straight ahead or angled to right or left. Ruggedly constructed for tough bulldozer service.

THE FRANK G. HOUGH CO.

Libertyville, Illinois

"Since 1920"

Over 3,500 Hough Tractor Shovels Now in Service

The Bucyrus-Erie DOZERSHOVEL *GETS IN...AND DIGS!*

There's plenty of room all around as this Dozershovel moves into the low, narrow archway to pick up a big load of bricks . . .

. . . It carries the load to the spoil pile, dumps, then returns to repeat the operation — in a profitable hurry.

Low clearance . . . close quarters . . . tough digging . . . The job of cleaning out an open hearth furnace was painfully slow and expensive, for it had to be done by hand — until a Bucyrus-Erie Dozershovel went to work on it. Then things were different, because the Dozershovel's low over-all height allowed it to move right in under the arch, its powerful digging action let it take big bucket loads, its maneuverability permitted easy going from furnace to spoil pile. This important war job could now be done fast, economically, profitably.

This is just one of the many unusual jobs, hitherto done by hand, that the versatile Dozershovel handles efficiently. In addition to the unit's use as a shovel, a quickly interchangeable dozer blade permits full-fledged dozer service, and a hook on bucket or blade provides for utility crane application. Get the complete story of this new unit for T9 and TD9 International TracTracTors from your International distributor.

N-65

BACK THE ATTACK!

BUY WAR BONDS

BUCYRUS ERIE TRACTOR EQUIPMENT

SEE YOUR INTERNATIONAL TRACTRACTOR DISTRIBUTOR

War Inspired

KNOW YOUR NEAREST BLAW-KNOX DISTRIBUTOR

ALABAMA
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ARIZONA
Phoenix — State Tractor Equipment Co.
ARKANSAS
Little Rock — Lyons Machinery Company
CALIFORNIA
Los Angeles — Le Roi-Rix Machinery Co.
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San Francisco — C. H. Grant Company
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Louisville — Brandeis Mach. & Supply Co.
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New Orleans — Southern States Equip. Co.
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Portland — Stanley-Cadigan Company
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Boston, Mass. — The Equipment Co.
Portland, Me. — Stanley-Cadigan Co.
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New York, N.Y. — R. E. Brooks Company
Philadelphia, Pa. — Giles & Ransome
NEW MEXICO
Albuquerque — Hardin & Coggins
NEW YORK
Albany — Larkin Equipment Co.
Buffalo — Trevor Corporation
Elmira — LeValley, McLeod & Kinkaid
Endicott — Newing Motors Co., Inc.
New York — R. E. Brooks Company
Rochester — Keystone Builders Supply
Syracuse — Syracuse Lumber Co.
Utica — McQuade & Bannigan, Inc.
NORTH CAROLINA
Raleigh — Carolina Tractor & Equip. Co.
Salisbury — Carolina Tractor & Equip. Co.
NORTH DAKOTA
Fargo — Dakota Tractor & Equipment Co.
OHIO
Cleveland — H. B. Fuller Equipment Co.
Columbus — W. W. Williams Co.
OKLAHOMA
Oklahoma City — Leland Equipment Co.
OREGON
Portland — Contractors Equipment Corp.
PENNSYLVANIA
Philadelphia—Giles & Ransome
Pittsburgh — Dravo-Doyle Company
RHODE ISLAND
Boston, Mass. — The Equipment Co.
SOUTH CAROLINA
Columbia — Jeff Hunt Road Machinery Co.
SOUTH DAKOTA
Rapid City — J. D. Evans Equip. Co.
TENNESSEE
Chattanooga — Nixon-Hasselle Co.
Knoxville — Wilson-Weesner-Wilkinson
Nashville—Wilson-Weesner-Wilkinson Co.
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Dallas — Conley-Lott-Nichols Mach. Co.
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VIRGINIA
Roanoke — Roanoke Tractor & Equip. Co.
Baltimore, Md. — Henry H. Meyer Co.,
WASHINGTON
Seattle — Star Machinery Co.
Spokane — Empire Equipment Company
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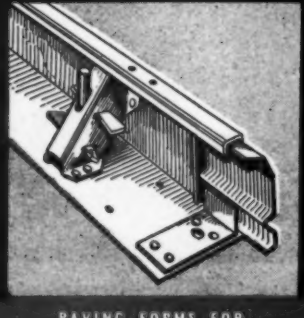
Winnipeg — Kane Tractor & Equip. Co.
NEW FOUNDLAND
St. Johns — Dominion Dist. Co.

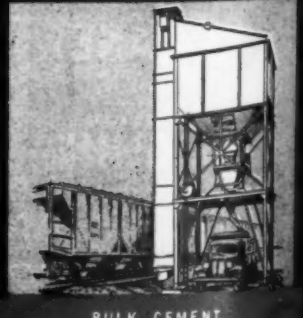
Blaw-Knox Construction Equipment is in use by our armed forces all over the world — where the going is toughest — on the construction of air bases and access roads. ¶The war is teaching old dogs new tricks — and new points on design and construction, war inspired will be found in the Blaw-Knox Construction Equipment you will be using for post war construction. ¶Blaw-Knox Construction Equipment has been improved to provide greater production, lower cost of operation and higher quality of work

BACK THE ATTACK WITH WAR BONDS AND STAMPS


PAVING SPREADERS FOR AIRPORTS AND ROADS


FINISHING MACHINES FOR AIRPORTS AND ROADS


PAVING FORMS FOR AIRPORTS AND ROADS

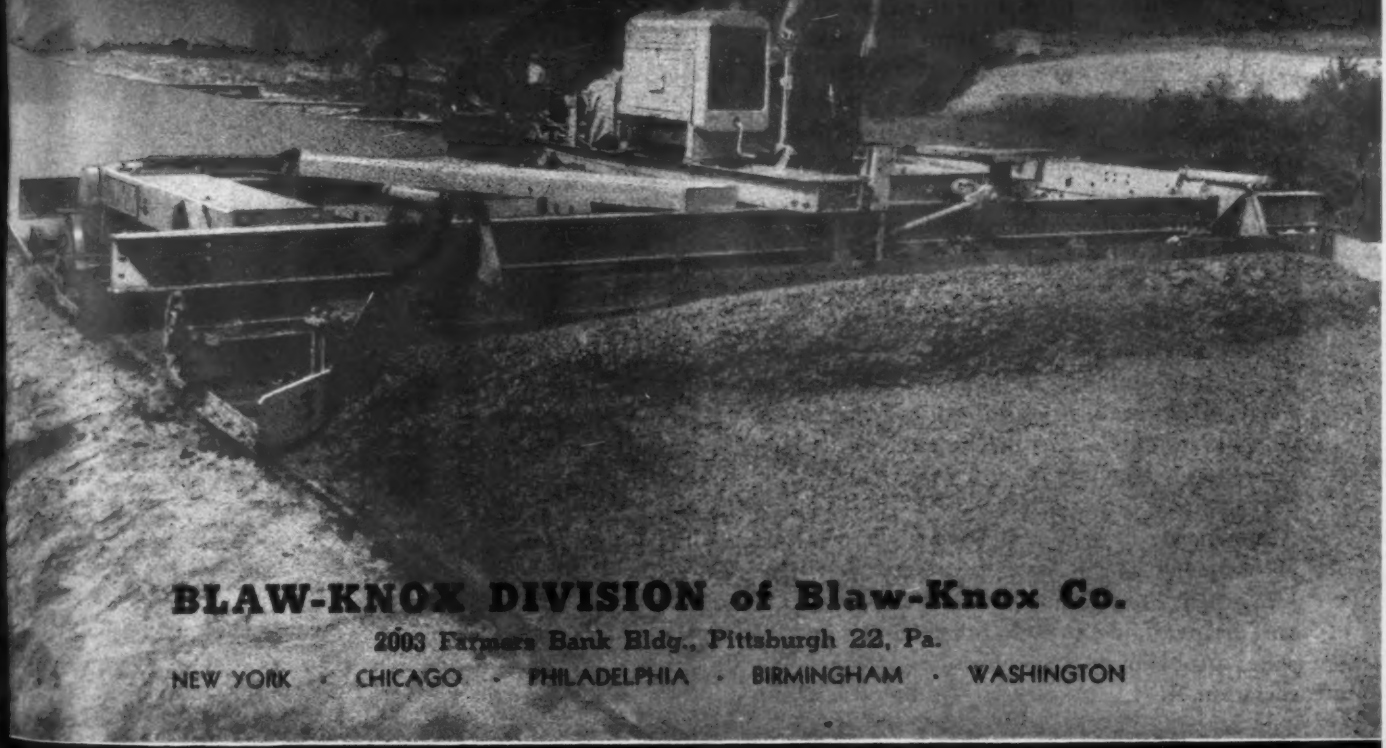

BULK CEMENT PLANTS

Improvements..
- now in action

will be found in the NEW

BLAW-KNOX
Construction Equipment

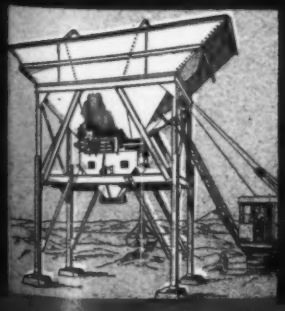
You will be using for the post war road and airport program



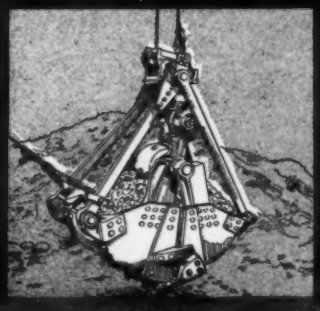
BLAW-KNOX DIVISION of Blaw-Knox Co.

2003 Farmers Bank Bldg., Pittsburgh 22, Pa.

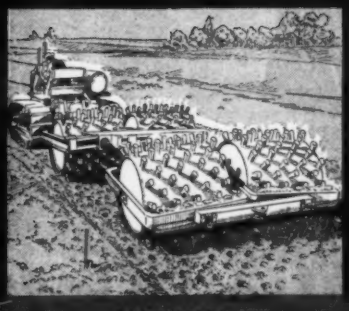
NEW YORK · CHICAGO · PHILADELPHIA · BIRMINGHAM · WASHINGTON



AGGREGATE BATCHING PLANTS



CLAMSHELL BUCKETS



SHEEPSFOOT TAMPING ROLLERS

CONCRETE BUCKETS

Dependable Globe-Trotter

OSGOOD SHOVELS and CRANES Go Where the Fighting and Digging are TOUGHEST

Headed for the fighting front are another 48 tons of cargo that will "dig down" and pay its own passage anywhere.

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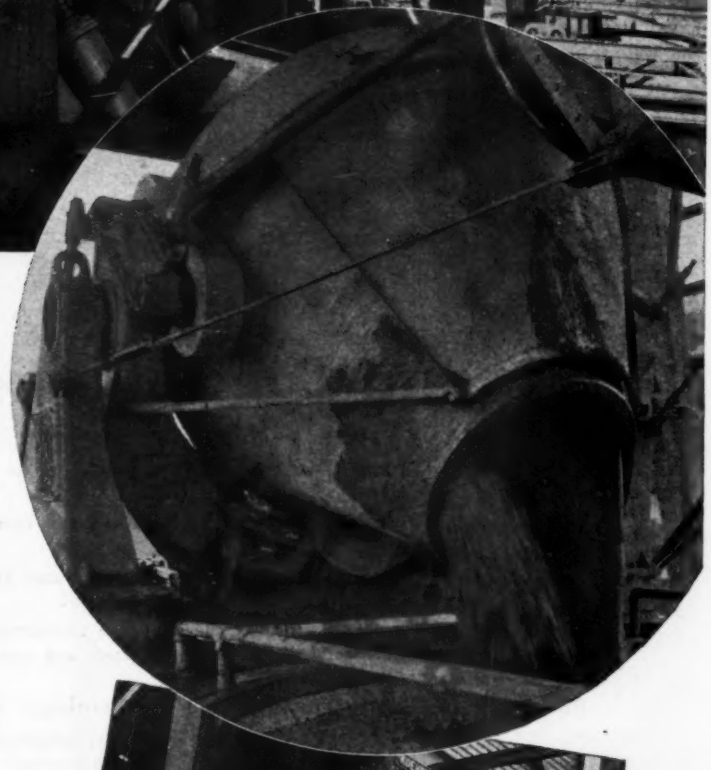

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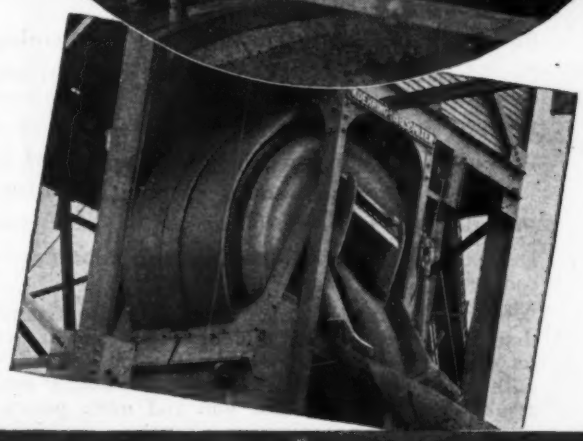

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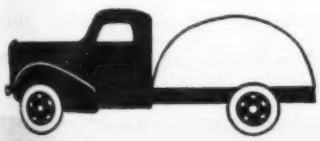

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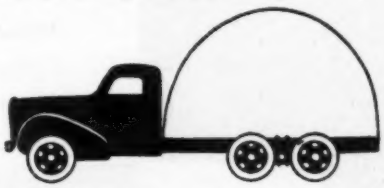

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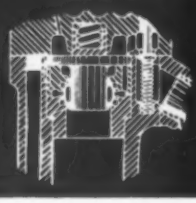

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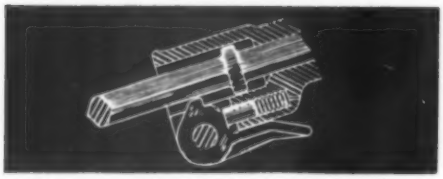

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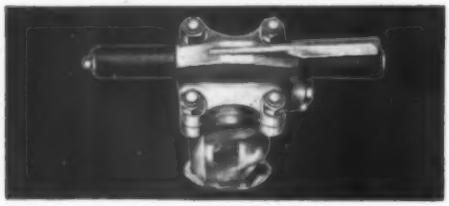

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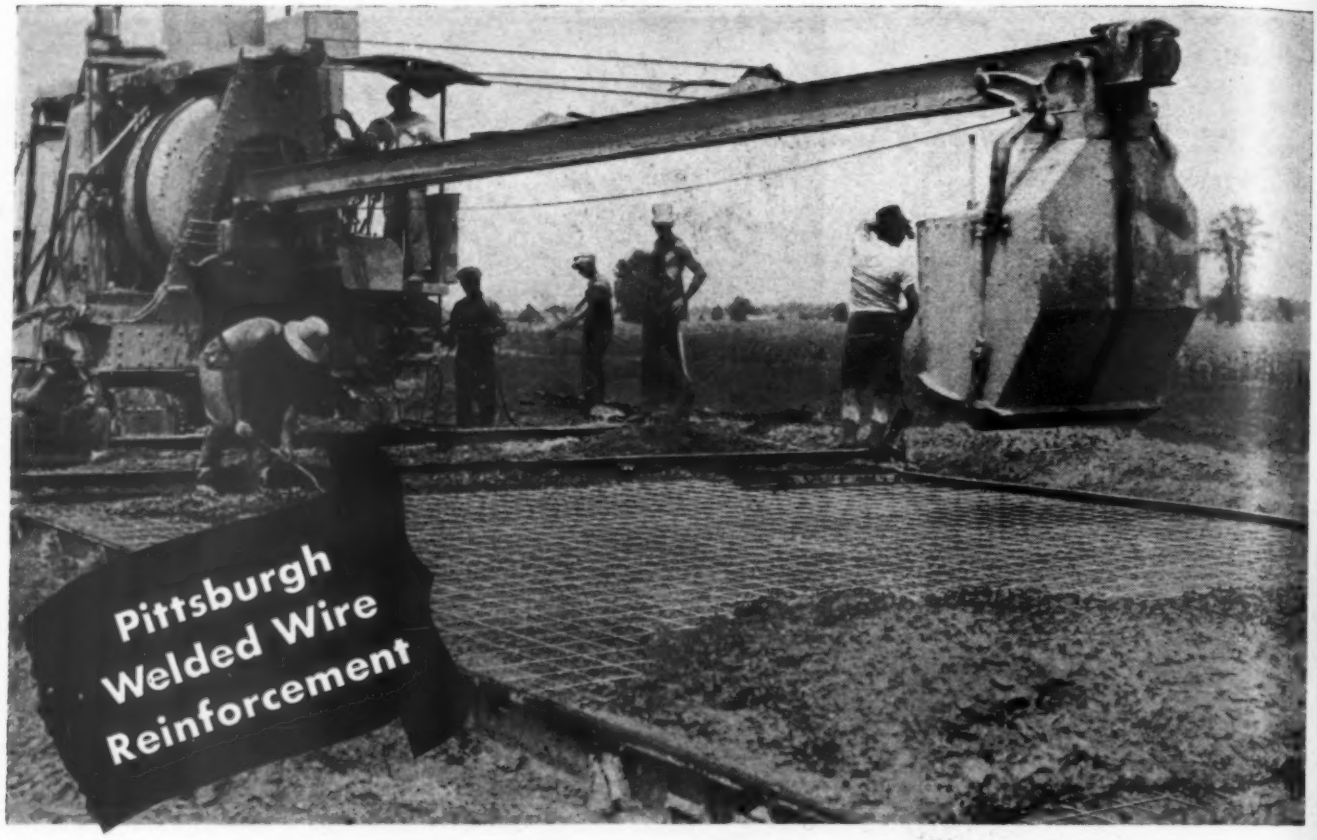

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Yours very truly,
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ROADS AND STREETS

May, 1944, Vol. 87, No. 5

Runway Extensions a Mucking Job

. . . at southeastern air depot where draglines, dozers and scrapers followed interesting procedure to bail out 20 ft. of ooze and backfill with sand

SWAMP excavation is an old story to the H. E. Wolfe Construction Co. of Tampa, Florida, but this outfit had to open up its whole bag of tricks recently at Warner Robins Air Depot near Macon, Ga.

Extension of three runways to meet new requirements for heavy bombers necessitated removing about 230,000 cu. yd. of swamp mud and backfilling with suitable material. The job involved approximately 1,250,000 cu. yd. of unclassified excavation, with approximately 1,000,000 ½ mile-yards of overhaul, plus 450 acres of very messy clearing and grubbing and over 500 acres of timber clearance for glide angle.

The Wolfe contract totaling about $600,000 also included 20,000 lin. ft. of new concrete pipe storm drain, which was necessary in order to extend three runways to meet new criteria recently established for heavy (B-29) bombers. New design standards call for 80-ft. shoulders along taxiways.

As shown in Fig. 2, the plans call for clearing and grubbing to produce a clear zone 1,000 ft. long and 1,500 ft. wide beyond the end of each extension followed by an approach zone fanning out to 4,000 ft. wide in a distance of about 2 miles. In the case of two of the three extensions, this zone extended over swampy river bottom land and the work of cutting trees was slowed by the difficulty in getting labor to do the very unattractive work involved. It has been necessary for workers to wade waist deep with saws and axes, and an offer of extra pay has not always brought a full crew of workers what with a common labor shortage in general. Power saws augmented hand sawing.

Muck Removal Methods

The existing runways lay so close to an adjacent swamp that two of the three extensions headed directly into "trouble," and it became necessary to remove swamp mud down to sandy soil. Approximately 65,000 sq. yd. of swamp area was thus excavated.

A typical grading cross-section through muck in relation to the runway extension is shown in Fig. 1. In general, the scheme was to bail to a depth of about 20 ft. below existing ground muck line, making the hole about 240 ft. wide or sufficient to take in the limits of 1½ to 1 pressure angles leading from the pavement edge, as shown in Fig. 1.

Mud from this hole was cast and recast by the draglines so that most of it lay beyond the shoulder lines of the 500-ft. graded width.

A typical procedure for muck removal is shown in Fig. 4. Here, the dragline operator first took a cut about 30 ft. wide along one side of the center-line (as in A), casting out-

Extending runways into swamp on this Georgia project was a Roman holiday for draglines

Draglines dredged 20 ft. down to sand, taking out muck in working strips about 30 ft. wide

Muck-it Brigade! Swamp mud was recast as many as 5 or 6 times to the edge of the berm

ward as far as possible into piles for two or more recastings with other draglines. As many as 5 or 6 recastings were required to get mud to the edge. Next trip he took out an additional 30 ft. (B). Sometimes the operator could make a third parallel trip (C), and similar operations on the other side of the center-line brought the pit to about the width needed.

Much of the time, however, this work was hampered by frequent heavy rains which kept the soil very wet and unstable. The machines lived on mats. Under these conditions the toe of earth at X often had a tendency to slump away, making it impossible for a dragline to work. Wheel-type scraper units loading from draglines were also in here pitching whenever conditions permitted, hauling to several dump areas, and dozers were kept busy putting the grade in shape.

The first and largest of the pits (N. E. end), was done almost entirely without the help of pumps. Pumping was undertaken too late to be of any help, since it was discovered that the draglines roiled mud into such a thick slime the pumps couldn't handle it. The second and smaller mucking job (the E. end), however, was considerably speeded by getting a head start with pumps. Here the water was lowered considerably by the time bucket casting began.

Swamp Filling a Tricky Job

An extensive borrow pit for backfill material was opened up after making test borings over the area to determine the nature and stratification of soil. Borrow material consisted of sandy layers peeled up while at the same time saving the best available material for upper layers of the new pavement subgrade. Backfill for the swamp area consisted of a coarse granular sandy soil, the material being specified as 92% sand below the water line.

This would have been an excellent place to put a dredge, but stumps ruled this out. Stumps were undermined and pulled out by the draglines as mucking progressed.

The heavy slime created by the draglines created an interesting problem, that of preventing slime "pockets" from being enveloped by backfill material deposited under water. The scheme adopted was to gradually push this slime to one side and replace it by skillful depositing of new material on the bottom and upward from the bottom. During the final stages of filling the big N. E. pit, slime in large quantities was forced clear out and over the banks as the sand displaced it.

When the filling bank was close to the water line, it was found that when bulldozers pushed bank material over the edge it would sometimes slide outward into the water and envelope some of the slime on the bottom. Better luck was had by building up the fill to a height of 3 to 5 ft. or more above the water. By directing scraper dumping and doing some dozer work a "cat head" was shaped along the edge of the filling, then dozed out and downward in such a manner that the weight and slide angle of the material would send it evenly to the bottom of the pool, leaving almost 100% solid backfill. Keeping the sandy backfill at least 3 ft. above the backfill also aided in stabilization, which progressed with sheepsfoot rollers as soon as they could get in.

The largest or N. E. pit extended about 500 ft. along the runway center-

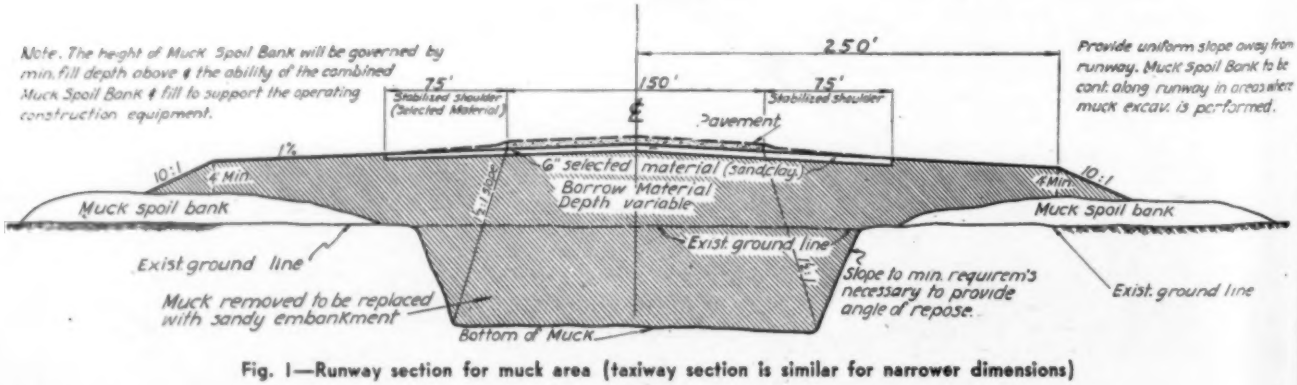


Fig. 1—Runway section for muck area (taxiway section is similar for narrower dimensions)

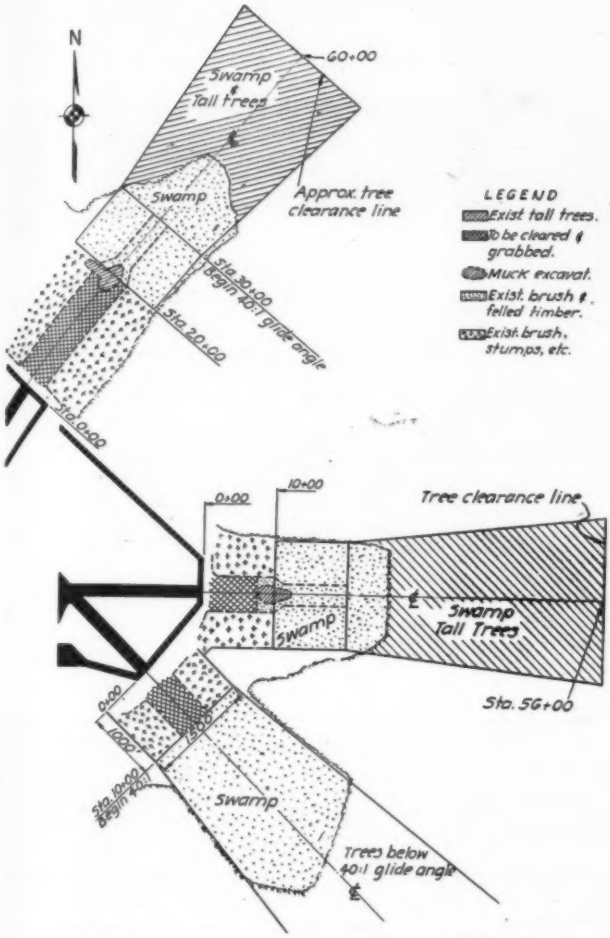
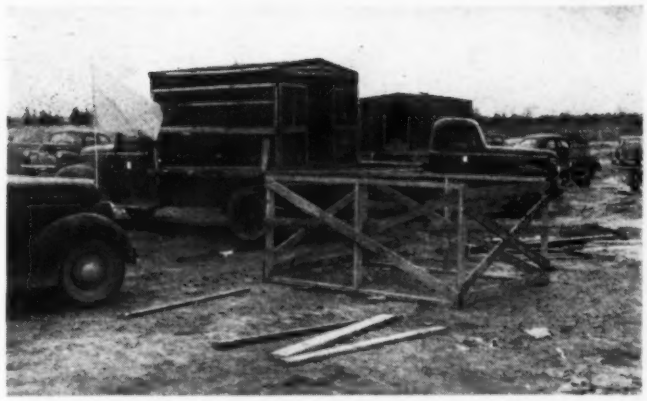


Fig. 2. Clearing and grubbing plan, showing glide angle clearance, clear zone, approximate areas of muck-removal, and runway extension areas in relationship to existing pavement



"Black Marias" used to take Wolfe Const. Co. workers to and from the job in bad weather. On arrival, they're slid off onto frames built to height of truckbed. The shelters are of flimsy paper-and-scrap-lumber construction. (Day labor workers are tempted to pilfer better materials such as sheet metal, gypsum board, or plywood.)

"Tower" for Wolfe's diesel fuel syphon, erected with minimum critical materials by a handy dragline

line to a point beyond the end of the new pavement and required about 150,000 cu. yd. of excavation.

No Muck Removed Beyond Runways

In spite of misgivings in some quarters, it was decided to build up the grade for the 1000-ft. clear zone beyond runway ends by dumping new material directly into the swamp without removal of muck. Fills of excellent initial stability were obtained, as indicated by ability to hold up under heavy equipment. Every index to date indicates that this expedient was justifiable.

All classes of usable material out of the borrow pit were placed in the clear zone areas, including some heavy clay.

In this area the compaction obtained was unusually good after several feet of fill had been placed over the muck.

H. E. Wolfe Construction Co. got its contract in November, 1943, and fought wet weather continually from start until completion of its work in May. This outfit had to use every expedient to gain a few hours here and there. On the few days that moisture was down to optimum inside paving areas, its outfit concentrated on these areas to get them completed first. One of the first steps, the one that paid big dividends, was to build three 50-ft.-wide haul roads, complete with carefully shaped ditches and shoulders, using a good sandy clay. These roads enabled hauling work to proceed on many a day when otherwise no motors would have turned.

A specification minimum of 6 in. of "selected material" (actually about 24 in. much of the time) was used to top out the pavement grade. The grading contract called for bringing the finished subgrade to 1% uniform transverse slope each side of the c.l., the paving contractor to blade down for edge thickening, etc., in his fine grading operations (Fig. 5).

Notes on Subgrade Material

The subgrade was built up and swamp areas filled largely from two large shallow pits. From test hole data a plan was made up showing pit location and details.

Soil mechanics was of first concern on this project. The material was an ideal sandy clay for the most part but other materials ranging from pure sand to Kaolin were blended by controlled dumping. While tractor-scraper units handled shorter haul work, much borrow was picked up with elevating graders and pans and carried by Euclids and Tournapulls on 4,000 to 7,000 ft. haul.

An interesting point was the fact

Borrow material for swamp filling and runway grade was peeled up from extensive shallow areas using scraper and elevating graders. This outfit loaded a 16 cu. yd. wagon in 50 seconds in good going

At Warner Robins Field looking along the center-line of the east runway extension shows partially backfilled swamp areas. Dozer bank at the left. At time of photo (March, 1944) work had been stopped by heavy rains and by high river stage (note driftwood left along bank by receding flood)

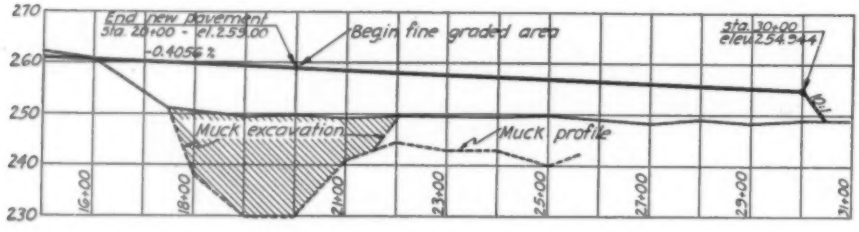


Fig. 3. Profile of N end of N-E runway, showing muck area in relation to runway extension

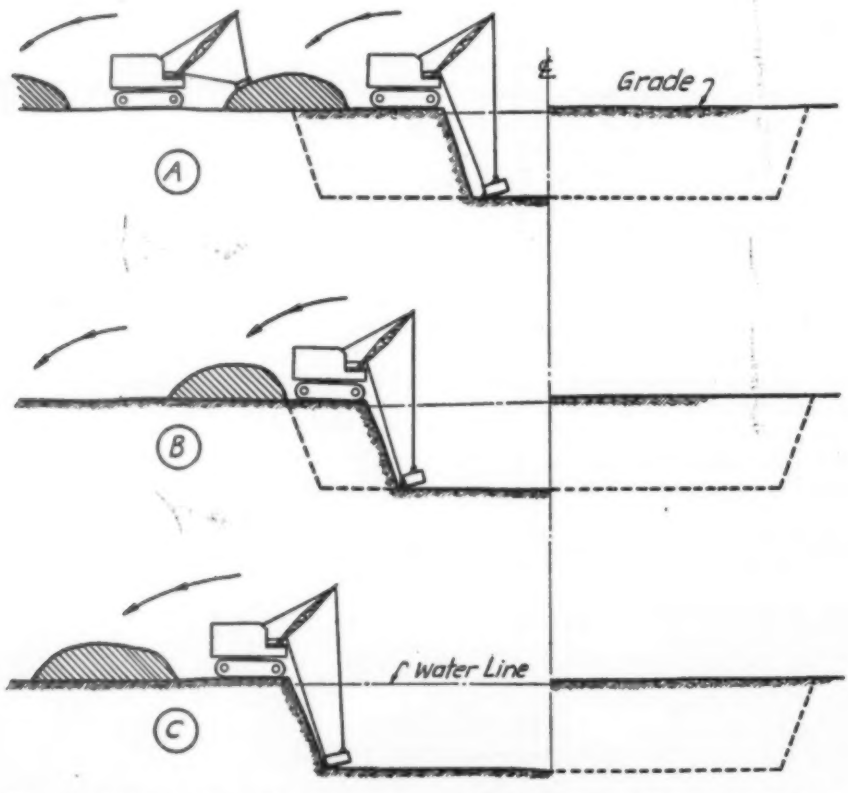


Fig. 4. Typical stages in mucking out swamp area with draglines. Draglines loaded "pullers" and scrapers in addition to side casting and re-casting

that a well graded sand-clay material which would have tested as ideal for highway subgrade stabilization in general was discarded in favor of an A2 sandy loam, high CBR material, which in the light of runway test data would seem preferable for use immediately under wide expanses of pavement. Tests have shown that very frequently with well graded stability material a permanently saturated condition develops under runways after about 12 to 18 months' service, with attendant reduction in compaction and load carrying capacity.

Equipment List

H. E. Wolfe had an all-Diesel outfit (except some trucks) consisting of the following major units

17 Euclids (13-yd.)
9 Tourapulls (9-yd.)
3 24-yd. scrapers
4 12-yd. scrapers
2 15-yd. scrapers
21 heavy tractors for scraper and dozer work
4 heavy push tractors
2 elevating graders
1 heavy-duty rooter
6 draglines (some with clam buckets)
6 light plants
6 sheepsfoot units
5 pick-up trucks
5 motor graders

Pavement of Heavy Design

Paving to cost about $500,000, was let to W. F. Bowe Co., Augusta, Ga. This contract also included three double 6x6 ft. box culverts (1,200 ft., 500 ft., and 230 ft.) and three single 5x8 ft. box culverts totaling 3,050 cu. yd. class A concrete. Extensions consist of one 1,000-ft. and two 2,000-ft. strips. Runways are 150 ft. wide plus two 10-ft. paved gutter sections. All paving is designed for a 60,000-lb. max. wheel

loading; runway extensions proper, 11-7½-11 in. cross-section, warming mats and concrete taxiways, 12-8½-12 in.; bituminous taxiways of corresponding design. New concrete totaled about 127,000 sq. yd.

Of note is the runway gutter design developed by the Engineers. It consists of a concrete pavement with edge thickness matching that of the adjacent pavement, and with 3-in. depression at the flow line except at points immmediately downhill from each inlet where a distortion is created as shown in Fig. 6. Inlets are spaced about 100 ft. apart and consist of the usual concrete drop construction with 21x24 in. grating frame.

Tests in service have shown that this design is ample to take care of the heavy seasonal rain encountered (annual rainfall about 50 in.), and is excellent from the standpoint of operating safety.

A-1 Equipment Care

The Wolfe outfit is known as one which takes the best of care of its equipment. Wolfe also has an operating philosophy expressed by the adage, "It's cheaper to let your tractor motors idle when not operating than to work them a couple of hours a day with cold motors. Keep going 24 hours a day, if you can." This job was on two 10-hour shifts but plenty of machines paused only for servicing.

The company had a well-organized field shop manned by a foreman, 3 welders, 12 mechanics and 5 helpers, who worked one shift only.

Two pressure grease trucks with chassis and body details designed by the Wolfe mechanics serviced the machines on the job. Three arc and 2 acetylene outfits were kept busy doing salvage and repair work, it being the policy to build up worn gears and do other welding work of this nature only where parts were unobtainable or waiting for them would hold up the work. A mechan-

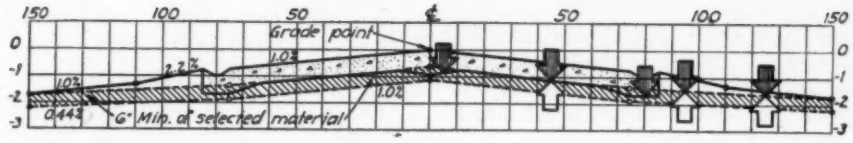
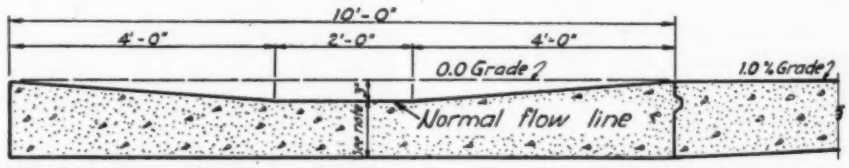
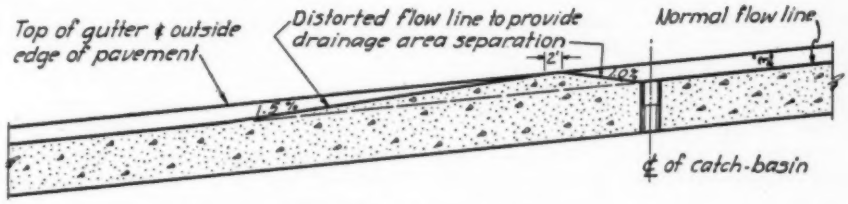


Fig. 5. Typical grading section. Cutting down for edge thickening at center and edges to be done by paving contractor just in advance of paving operation



Note:-Thickness of gutter at flow line to be 3" less than thickned edge of runway to which it is adjacent except at distorted portions of normal flow line behind inlets.

TYPICAL CROSS-SECTION OF RUNWAY GUTTER



LONGIT. SECTION OF GUTTER AT INLET

Fig. 6. Concrete gutter cross-section, and longitudinal section, showing warping upward of depressed center at inlets

One of H. E. Wolfe Construction Company's specially built grease trucks. Hose reels are mounted on a stair-step arrangement built out of heavy sheet iron under which is room for grease supply, etc.

(Left): Turning over wet subgrade preparatory to starting concrete paver on apron extension. Wm. F. Bowe Co., contractor. (Right): Getting ready to move finegrading equipment to another lane

ical track press was also in service; likewise a modern steam cleaning outfit, a hydraulic press, riveting machine for brake linings, usual bench equipment, and parts depot.

Over $40,000 in spare parts were brought to the field by the contractor, who invested another $50,000 in parts before the work was completed.

The foregoing improvements were under the direction of the U. S. Engineers, Savannah District.

See page 94 in this issue, Construction Equipment Maintenance Section, for photos taken in and around the Wolfe field shop.

This 1200-ft. culvert is one of three double 6x6 ft. structures required

War Time Traffic Training

The 7th National Institute for war time traffic training will be held June 19-20 at Northwestern University, Evanston, Ill. Seven courses will be presented: Traffic Officers Training, Traffic Engineering, Motor Vehicle Fleet Supervisors Training, Emergency Drivers Corps and Car Care (Instructors' Course), Drivers' Training (Administration and High School Instructors' Course), Training School Bus Drivers (Administrator's and Instructor's course), Accident Records and Their Use. The purpose of the Traffic Engineering Course is to aid those engineering agencies responsible for the design, planning and traffic regulation of roadway and parking facilities by developing the engineering techniques employed in reduction of accidents and congestion. Information can be obtained from the National Institute for War Time Traffic Training, 321 Tower Bldg., Washington, D. C.

Prospective Doubling of Wages and Prices

By HALBERT P. GILLETTE

SHORTLY after the close of the last war I directed an appraisal of the property of a large public utility company. As a part of this work a thorough study was made of price and wage increases during and following all modern wars, the object being not only to determine the major causes of such inflations but to assign quantitative factors to each. A large staff of assistants was busied in this economic research for about a year. The condensed results of the investigation were first published in "Engineering and Contracting," April 7 and May 5, 1920, and later in Chapter 2 of my Handbook of Construction Cost.

It was found that in America average annual wage rates had been closely proportional to per capita currency, and that average commodity prices had varied directly as the product of per capita currency and its "velocity of circulation," and inversely as the annual per capita output of the workers.

At the beginning of the World War in 1914, American per capita currency was $34.35, but had increased to $54.74 by July 1, 1919. After the collapse of the post-war boom in 1920, average commodity prices were about 60 per cent higher than in 1914, but declined very slowly until the great depression began in 1929. That decline was the result of increasing use of powered machinery and other inventions that increased the output of the average worker. But average wage rates continued to rise until 1929 in proportion as per capita currency increased. In short the wage and price formulas published in 1920, as noted above, continued to hold true. The long depression that began in 1929 reached its lowest level in 1933, and then also the velocity of circulation of currency attained an all-time low. Even when the present war began in Europe in 1939, the business depression that began 10 years earlier had not entirely ended.

In July 1940 our per capita currency was about $80, and in May 1944 it is about $150. Hence its inflation has already been about 90 per cent. Our per capita bank deposits have risen an equal percentage in four years. So whether we gage the ultimate inflationary effect on wages or commodity prices by the increase in currency or in bank deposits (often called credit currency), it is probable that both average wages and prices will become double what they were in 1940 soon after they cease to be "frozen" by government ukase.

It has been suggested by some political economists that the government should continue to "freeze" wages and prices for several years after the war ends. But I have seen no plan whereby ultimate inflation of wages or prices is likely to be prevented. On the other hand there has been abundant evidence that neither farmers nor labor unions intend submitting to a post-war control such as they have experienced during the war. As a matter of fact, the cost of living has already risen about 25 per cent in spite of the "freezing" of prices and rents. Since rents constituted about one-quarter of the cost of living it followed that food and clothing have risen more than 30 per cent. The attempt to dam back the flood of new currency has been only partly successful during the war. The dam, in fact, is leaking prodigiously. Let the professional wisemen continue ever so "wisely" to control the money flood, it is certain ultimately to double both wages and prices, for no political party could long survive if it were to sponsor post-war "freezing" of the prices of farm products or the wages of workers.

Progress On Cleveland Freeway Program

Central interchange adopted as No. 1 post-war task in $150,000,000 metropolitan system comprising seven limited-access radials, inner and outer belt, crosstown freeway, and related parkways

By R. C. CHANEY
Regional Planning Engineer,
Ohio Department of Highways, Cleveland

IN 1943 the Cleveland region was selected as the scene of a planned attack on traffic congestion by the Ohio Department of Highways. Under Director Hal G. Sours the Department undertook elaborate studies toward an integrated traffic plan, this work having grown immediately out of a local right-of-way bond issue voted in 1940 and the state's agreement to build certain piece-meal improvements. As related in a previous article (ROADS AND STREETS, June, 1943, "Cleveland Freeways a Major Problem"), earlier local effort to relieve congestion was stymied by inability to finance and by the impracticability of the scores of local political and administrative subdivisions to undertake a unified job. By the summer of 1943 the state had expanded the original Freeway Program to ten "first order" improvement projects as the planning objective, construction having previously been begun on one. General standards and characteristics of design were adopted, the two most important principles being (1) to add new relief ways rather than to widen existing facilities; and (2) to provide true limited-access design, with separated directional movement and other elements of the most modern express highway, as the only adequate answer to Cleveland's post-war needs.

Since last summer encouraging progress has been made in several directions. The ten principal projects have been more clearly defined, and a master freeway plan completed and agreed on by state, county, city and other agencies. Survey work and preliminary design studies have moved along, though actual detail design has gone slowly because of wartime personnel shortage. And unofficial agreement has been reached on the general features of the most urgent of the projects, the Central Interchange adjacent to downtown, which includes connections with the proposed Newburgh Freeway and an Inner Belt System.

What Plan Calls For

The Cleveland Express Highway Plan today calls for the following improvements:

A. **Seven Radial Freeways** from downtown to the outskirts. These projects and rough estimates of construction cost alone are:

West Shoreway, to be built in the lake, $15,000,000;

Berea Freeway, southwest past airport, $15,000,000;

Medina Freeway (25th Street relief way formerly called Jennings Freeway), south and southwest, $10,000,000;

Willow Freeway, construction already started, $6,000,000;

Newburgh Freeway, to southeast, $18,000,000;

Heights Freeway, east from downtown, $10,000,000;

Lakeland Freeway, leading northeast, parallel shore, but back from it, $5,500,000.

B. **An Inner Belt** circling the central business district and including the above-mentioned Interchange between the freeways themselves and the surrounding surface street system, $23,000,000.

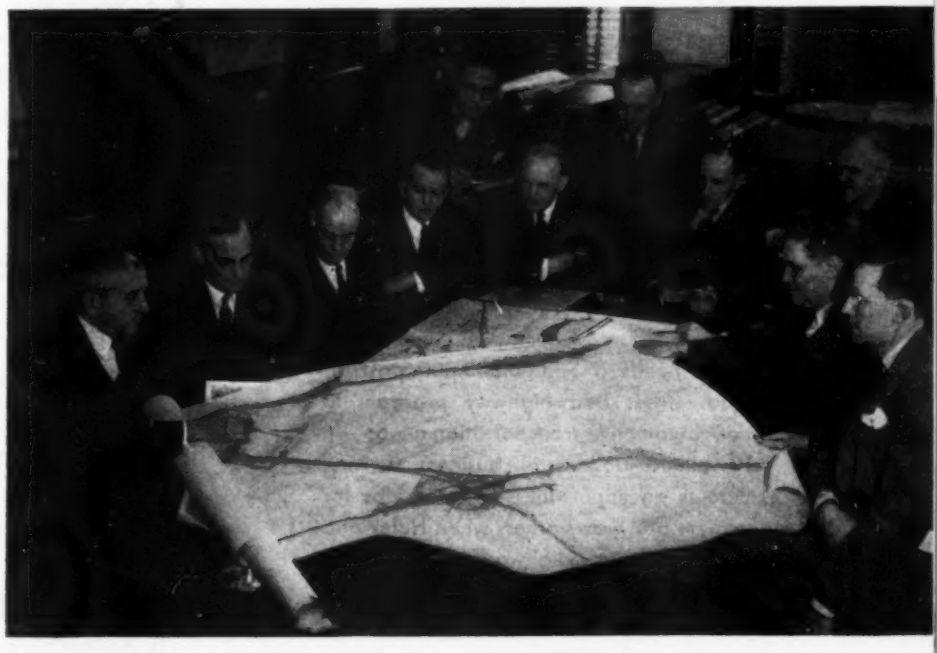
C. **An Outer Belt** circling the edge of the metropolitan area and interconnecting all the radial freeways. This would comprise east, south and west elements and require an estimated $25,000,000 in the first stage of development.

D. **An East-Side Crosstown Freeway** (University Ave.), $18,000,000.

E. **Four Parkways**, integrated with the "main line" system (shown in segmental lines on accompanying map).

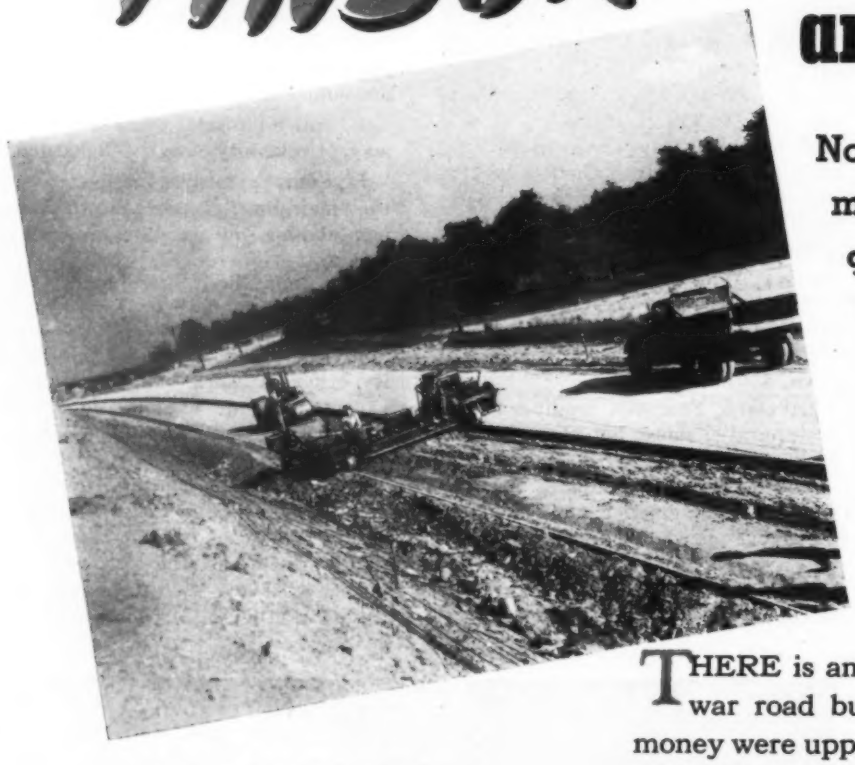
Inner Belt First Need

Foregoing cost figures of course are approximate and unofficial. No priority order of work has been adopted except that all are agreed on the prime urgency of the Inner Belt and Interchange. As now evolved, this system will take perhaps five years to build and require about 90 acres of right of way, at an unestimated but substantial cost. One area of twelve blocks will have to be cleared. Preliminary studies for this extremely



Here is the Express Highway Subcommittee of the Public Works Committee of the Regional Association, which developed the general plan for the Cleveland freeway system. Left to right, seated, they are: Martin M. Friedman, county bridge engineer; William E. Blaser, chief deputy county engineer; Morse W. Rew, chief engineer, City Transit System; Ralph C. Chaney, regional planning engineer, State Highway Department; Edward A. Fisher, city engineer of Lakewood, chairman County Plan Commission, chairman of the committee; Robert Hoffman, city consulting engineer; John Heffelfinger, city bridge engineer; John T. Howard, planning director City Planning Commission (partly hidden); Walter J. McCarter, director of City Transit System; James M. Lister, assistant planner, City Planning Commission. Standing, left to right, are: Antonio Kruz Kayanan, planning technician for Regional Association, committee secretary; Norman W. Wilke, engineer of design, Regional Planning Office, State Highway Department

the facts about FINEGRADING are . . .



No other existing equipment can prepare subgrade as quickly, cheaply and accurately as Buckeye R-B Power Finegraders.

THERE is ample evidence based on prewar road building jobs when time and money were uppermost in contractors' minds and on forced draft war jobs where time assumed a new and strategical importance, that Buckeye R-B Power Finegraders should be considered an essential part of every paving outfit. They offer these benefits: ability to cut the grade to accurate cross section, eliminating excessive loss of yield in slabs that are too thick and avoiding penalties due to slabs being too thin; ability to handle a heavy burden permitting faster, less accurate rough grading; speed that has been shown sufficient in some jobs to keep the grade out ahead of two double drum 34-E pavers working in tandem.

It doesn't cost anything to get more facts. Send for descriptive bulletin today.

BUCKEYE TRACTION DITCHER CO.
Findlay, Ohio

LOOK AHEAD

It has been estimated that every $100,000,000 invested in road construction creates $315,602,700 in business transactions. According to the American Road Builders Association, the United States needs a $3,000,000,000 postwar road, street and highway program to meet automotive transportation needs . . . 10 billion dollars of business activity! Here is an important source of jobs for soldiers and war workers when Hitler and Tojo go down. Highway officials, contractors and dealers can help put this program over in their respective cities, counties and states.

RB POWER FINEGRADER

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Tractor Equipment Trenchers
Road Wideners Spreaders
Power Finegraders Convertible Shovels

important and complicated system have been in progress for some time, aided by small-scale model projections and by aerial maps showing existing topography and all buildings and improvements in minute detail.

Recently a joint committee representing several public and civic agencies was set up to study the central interchange and general metropolitan problems. Four different schemes were merged into a single one, now tentatively adopted as a control for developing a more detailed design. Informal studies have now been worked out to the design stage.

The Inner Belt development will cause great changes in the character of much downtown business property, and require considerable rezoning along its path. The City Planning Commission has under way pilot studies for redevelopment and rehabilitation of residential areas adjacent to the Belt. Models will be used to portray its proposed character to committee members and citizens.

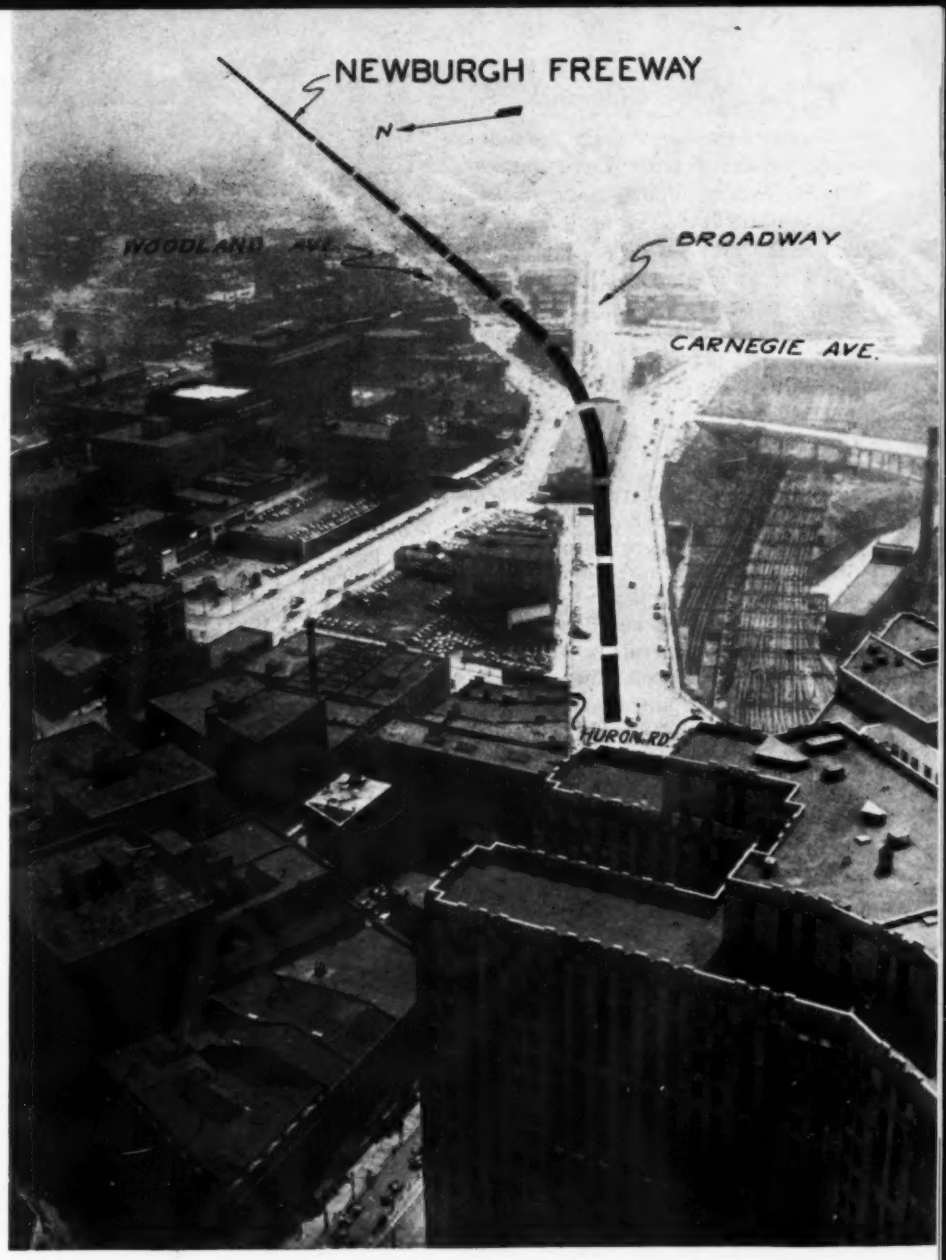
Preliminary Report on Newburgh Freeway

Recently a preliminary progress report on the Newburgh Freeway was made to the Ohio Director of Highways. The following summary of facts from this report gives some idea of the elaborate advance engineering work required before design work can begin on roadways and structures.

Newburgh Freeway must be designed to serve traffic from three sources, to do its part in the comprehensive network of major ways. These sources are:

1. Area relief; Broadway which the freeway will roughly parallel is now the "main street" of a definite sector of the metropolitan area.

2. Cross-town or transverse movement, largely non-local in origin, destination or both.



Showing proposed path of Newburgh Freeway, which is to follow new right of way parallel to existing facilities in keeping with fundamental design principle adopted for the Cleveland program

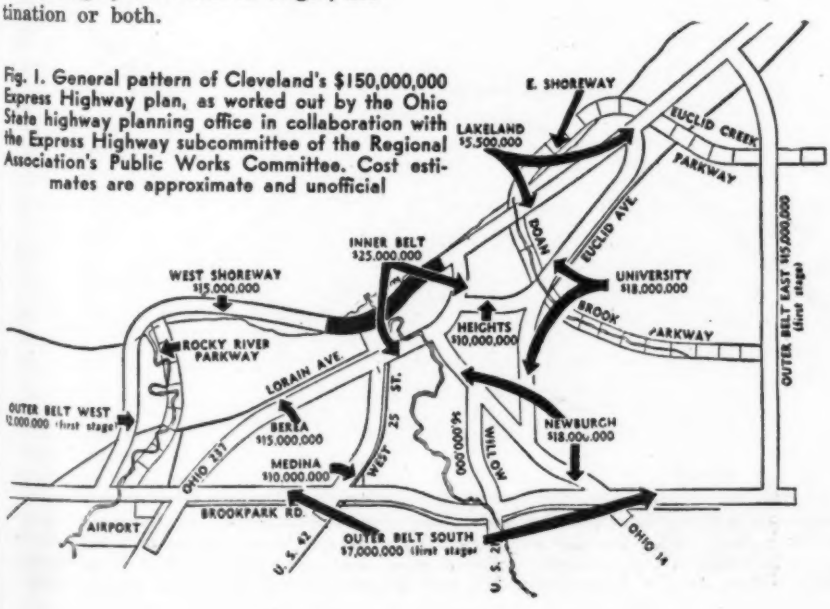


Fig. 1. General pattern of Cleveland's $150,000,000 Express Highway plan, as worked out by the Ohio State highway planning office in collaboration with the Express Highway subcommittee of the Regional Association's Public Works Committee. Cost estimates are approximate and unofficial

3. Principal radial movement, converging from important feeders.

Because the Freeway will follow the general line of Ohio route 14, direct route between Cleveland and Pittsburgh, it is a highly strategic location regionally.

In the Newburgh planning study, existing roads and streets of the metropolitan area were studied, as to their location and to their relation to the existing development (Broadway, Woodland, etc., see map) and traffic pattern. Also studied were the Federal, state, county and local routes, improvements and establishments, as to their characteristics and their service to the existing development. And the Cleveland Thorofare Plan, bus, truck and rail lines were considered in relation.

Basic Traffic Information

Traffic data, previously compiled, were avaliable from three sources. The Highway Planning Survey (1940-41) had conducted a comprehensive traffic survey of the Cleveland Area. The City and County had made traffic counts on streets and roads for several years. And special-purpose counts had been made since 1941 by the State highway planning office. After considerable research, data from the three sources on traffic-peaks and on turns were given a uniform tabulation. This work covered some 12,000 items (cross-sections or passing points). Data were listed under Street; Location; and Vehicles Counted (24-hr., 12-hr., peak ½-hr. each direction in A. M. and P. M.). The City's traffic department with assistance of the State planning office has made studies of turns, cordons, etc., in principal radials and the central section.

More study is to be given to analyses, graphs and investigations of turns, time study, classification, speed, delay, pedestrians, parking, control and regulation, capacities, trends and forecasts.

Analysis of Traffic Capacity

Only in relation to certain projects or phases have studies so far been made to determine required capacities for design directives. The Highway Planning Survey in 1940 adopted 1960 traffic as the base of objective capacities. It now seems reasonable to consider 1970 as the objective year, in order to allow a 20-year margin after completion and the adjustment of land uses and traffic. Study is being made of peak traffic upon radials to the central section, including the loads on nearby large bridges. The City Traffic Engineer is collaborating.

Adjacent existing streets have been studied for their characteristics and traffic data as bearing upon the design of this project. Adequacy of these streets, as indicated by the peak traffic data of the three agencies over recent years, is under investigation.

Also being investigated are such far-reaching factors as the tendency for radial and central traffic to increase faster than the city's population.

The combined effort of such factors as transportation trends, decentralization in spite of deterrent planning, mass transportation changes, return to "normal" registration curves, etc., must be weighed. And also recognized as having an effect are the even less determinate factors such as increase in miles-per-car, the attraction of safer and more economical facilities, and the influence of city growth on "main line" traffic increases. Peak traffic data are being studied with special care, since peak-period capacity is the final criterion of adequacy for the Newburgh or any Freeway.

The present land uses and principal thorofares of this area are considered as fixed conditions, subject only to changes that may come about in the industrial district and its possible expansion into the present residential development.

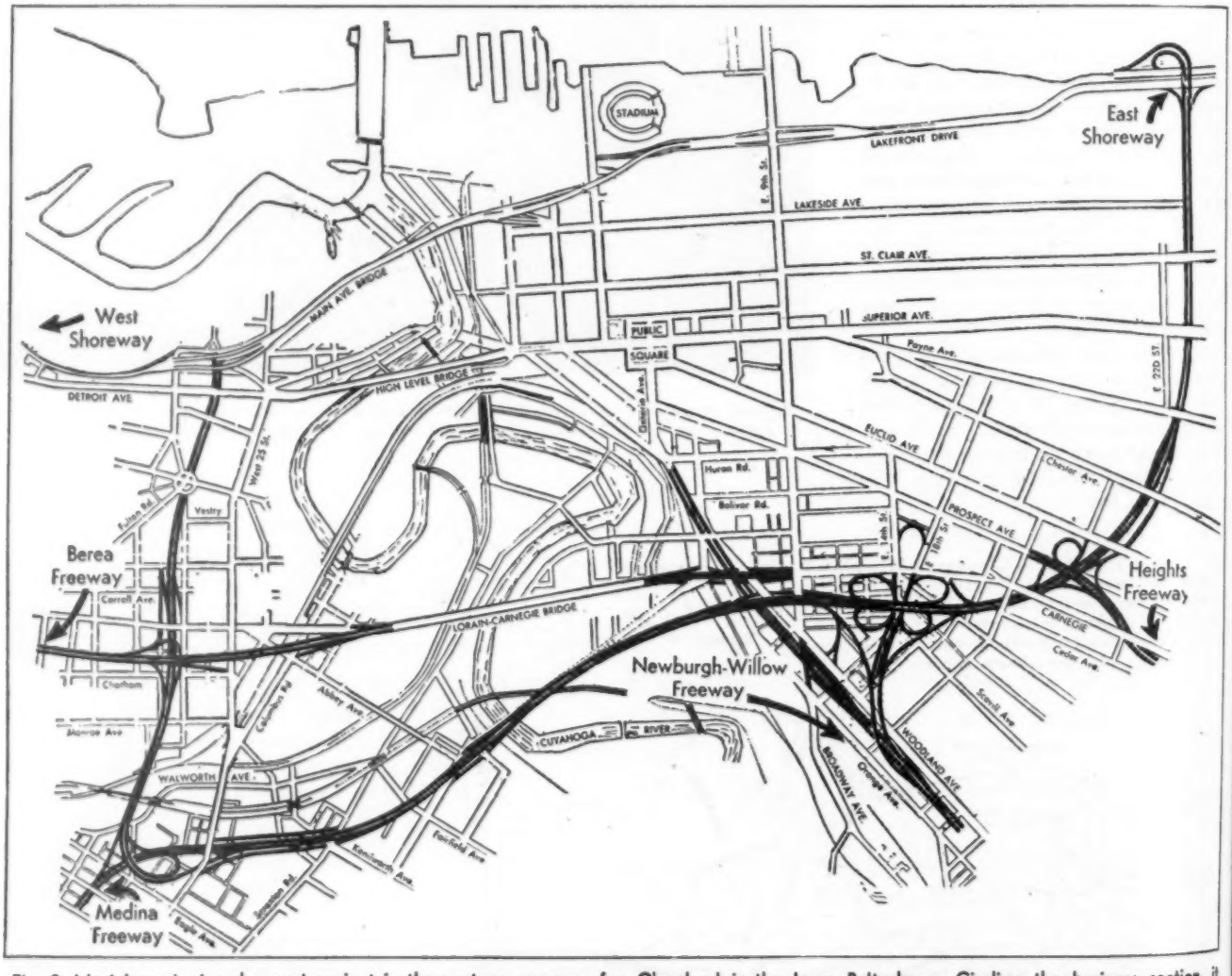


Fig. 2. Most important and urgent project in the post-war program for Cleveland is the Inner Belt shown. Circling the business section, it is designed to provide free-flow interchange of traffic between radial freeways and the existing street system, at a probable construction cost of $23,000,000. The Central Interchange referred to in article is the elaborate portion in lower right corner of map. Part of this feature is presently included in definite post-war program. (Main Avenue Bridge and link to East Shoreway at top of map are already built)

Affecting the ultimate traffic need, is the question of what mass transportation Broadway would continue to carry. Broadway today is overloaded, and it is proposed to segregate the local and external riders by offering local bus and off-street rapid transit. The fate of this plan cannot now (March, 1944) be foreseen. Continuance of the use of street cars on Broadway will further reduce the vehicular capacity of the street. Substitution of buses and elimination of cars and safety zones would tend to relieve street congestion.

A further relief would be obtained by taking out of Broadway that vehicular traffic which would be better served by an express highway near that street which might afford radial service with local and crosstown street collection and dispersal.

The traffic purposes, subject to the imperfect fluidity of the area, workers, local deliveries, general commercial haul, industrial trucking, recreational and mass transportation, present a conglomerate of mutually interfering traffic. The present load condition of Broadway in 1940 is shown by the substantial maintenance of the morning peak flow through the day to the late afternoon peak—evidence of saturation and all-day bottleneck congestion.

Also yet to be estimated or provided are the following important data:

The probable traffic which may be diverted to the freeway ("attracted" volume).

A. The economy of time and travel which may result from a favorable design; in short the economic justification of the project.

B. Topographical characteristics of available locations. Three deep valleys present problems of heavy construction. Aside from these and the existence of four railroad crossings, the physical situation is favorable to freeway construction in developed areas.

C. Alternate routes and selection of recommended location, with consideration of design standards, costs, effects of property, and traffic benefits.

A report is now in preparation which will apply the principles of modern limited-access or freeway design to the Newburgh Freeway problem, and present a tentative location and design.

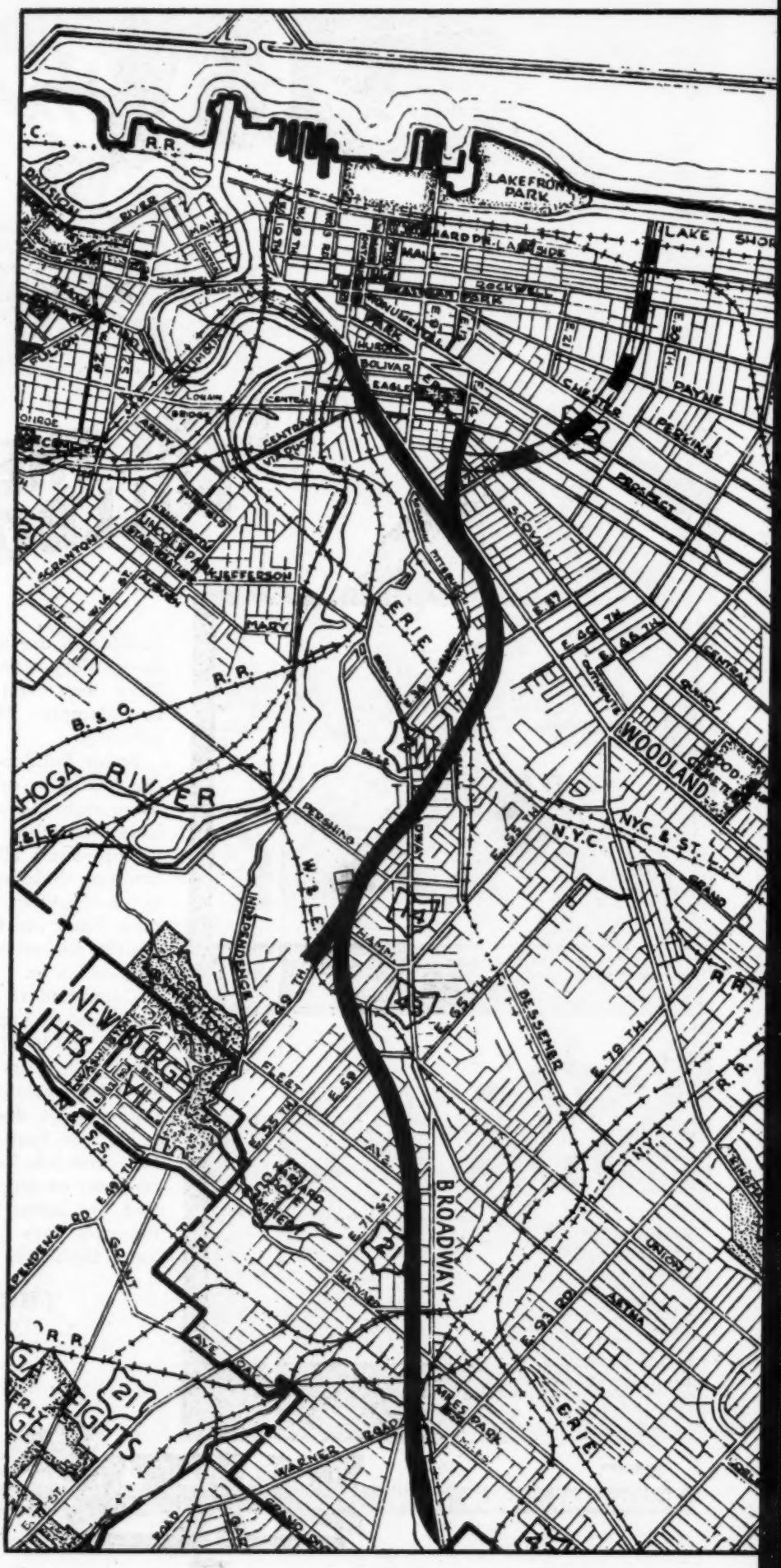


Fig. 3. Showing tentative route for Newburgh Freeway, advance engineering of which is already well under way. Freeway terminates near business district at top of map. Broken line shows a planned later stage connection with the lakeshore highway (a continuity for the New York Thruway) across Ohio

Baker Bulldozer on Allis-Chalmers tractor spreading, leveling and compacting sand on jetty for unloading supply ships! South Pacific.

Baker spreads material for another type of jetty to facilitate landing of barges.

Bulldozers are not fighting equipment. They pack no artillery—they have no protecting armor plate. They don't even enjoy pet names like "Lulu Belle" or "Memphis Mamma," but they are in there—pitching!

Baker Bulldozers are doing all right backing up the Yanks in every theater of war. You will find them right behind the fighting men — filling shell holes—leveling cratered air fields—excavating for underground oil tanks and ammunition dumps—building landing docks—digging drains and foxholes—making themselves useful to the fighting men. Their aid in consolidating positions on beach heads, mountain sides or sand dunes is hard to over-estimate.

Commanders of task forces have learned that it is almost as important to have bulldozers as tanks in the holds of their LST ships. Bulldozers have won their spurs and Baker Bulldozers, because of their fast, positive hydraulic control, dependability and rugged design stand high on the honor roll.

It's true that supporting our fighting forces is a full time job for Baker Bulldozers *NOW*. But just as soon as our enemies are vanquished, you will find the Baker ready to perform equally notable feats on your contracts. Send for a copy of "Unsung Heroes of War."

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BULLDOZERS SNOW PLOWS **BAKER** CONSTRUCTION EQUIPMENT

Telling the Public About Cleveland's Proposed Freeways

POST war metropolitan traffic relief programs involve elaborate engineering structures. Even more complicated are the economic and political problems. Yet the public must continually be appraised of the need for such developments. The official or engineer, who has struggled with pen in hand to put the elements and advantages in simple, readable terms, will appreciate the following paragraphs; they are part of a feature article by Robert Bordner in *The Cleveland Press*, February 29, 1944.

After heralding the completion and adoption of the Freeway Plan and describing its elements, Mr. Bordner went on to say:

"The entire system—radials and belts—is designed to move large volumes of express traffic safely at high speeds, into, out of, through and around the Cleveland region.

There will not be a side street, a cross street, a street-car track, a railroad crossing, a red light or any other obstruction to the continuous flow of automobiles, trucks and busses anywhere in the system.

Each part of it will be double roadway, one running in each direction.

The system will be elevated or depressed, no part of it using existing streets at surface.

It is designed as an addition to the present street and thoroughfare system.

Its purpose is to relieve present streets and highways of through traffic, freeing them of congestion, and permitting their convenient use once more by the traffic that has local business on them.

Through traffic is that which flows downtown and out daily, that which flows from one section to another at some distance daily. Only a minor fraction is the intercity traffic that is passing through Cleveland on trips between other cities.

The system is planned for construction by stages.

No Finance Problem Seen

It cannot all be built at once because the construction detours would make it impossible for the present traffic system to function.

It also cannot be built at once because the contract drawings cannot be prepared that rapidly. The war will be over before 20% of the plans are ready.

Work Started in 1940

Work on this master plan started after Cuyahoga County in 1940 voted $4,500,000 in right-of-way money on the commitment of the State Highway Department to build six items of freeway at a cost of $10,000,000.

But as planning on these sections of freeway got under way, it became apparent that their construction would make Cleveland's traffic problem much worse instead of better.

This was because the freeways were isolated sections without any relationship to each other, and no method for handling the traffic they would pour into the central section.

So out of those six pieces of freeway this system has been developed.

Then it was discovered that no one of the radial freeways could be planned without knowing in advance exactly how each of the others was to distribute and collect its traffic in the central area.

Reversed Planning System

So, planning from the outside in had to be reversed. Not until the inner belt (or central interchange) had been designed could any of the radials be designed.

It has taken the committee an entire year to work out the solution of this inner belt. Each of the freeways had to be interchanged with all the others, and each meshed into the existing streets system.

The plan had to take consideration of the existing buildings, the future mass transportation system needs, both rapid transit and local. The future of certain residence business, commercial and industrial areas was involved, along with provision for new central area parking facilities. Never before here has such a group of individualistic, top technicians submerged all personal and political difference and merged to use their best skills and judgments for the benefit of the whole community.

Men Who Did the Job

Members of the subcommittee that did this job are:

Edward A. Fisher, city engineer of Lakewood, chairman of the County Plan Commission, chairman.

Antonio Cruz Kayanan, planning technician of the Regional Association, secretary.

STATE: Ralph C. Chaney, regional planning engineer, State Highway Department planning office; Norman W. Wilke, his engineer of design.

COUNTY: William E. Blaser, chief deputy county engineer; Martin M. Friedman, county bridge engineer.

CITY: John T. Howard, planning director, City Planning Commission; James M. Lister, assistant planner for the commission.

Robert Hoffman, consulting engineer, City Division of Engineering; John Heffelfinger, city bridge engineer.

Morse W. Rew, chief engineer City Transit System.

Arthur F. Blaser, research engineer, City Transit System.

Vurnen Johnson, traffic engineer, City Safety Department.

▼

Computation of Overtime Labor Costs in Equipment Rental

A specific method for computation of overtime labor costs for operating and maintenance services that are rendered in connection with the rental of construction and road maintenance equipment was announced April 25 by the Office of Price Administration.

This action, which became effective April 29, 1944, was taken to end uncertainty and doubt within the industry as to a method of computing the overtime labor costs, and to define the policy of the agency with regard to permissible additions that may be included in such charges.

The overtime labor charge that may be included in the maximum price for operating and maintenance services furnished in connection with the base rental of equipment is now spelled out by OPA as follows: ". . . there may be added the dollar amount of so much of the excess of actual overtime over actual straight time wages as is paid such operators or operating crews, plus payroll taxes and insurance, but not including mark-ups thereon."

In other words, the addition of "out-of-pocket" expenses, such as payroll taxes and insurance, may be included with the actual amount of overtime labor costs incurred; while any mark-up on the overtime charges is expressly excluded.

Formerly the provision governing the overtime labor costs that could be charged said: ". . . according to the method . . . used on March 31, 1942." By unrestricted use of that method, OPA pointed out, a mark-up for overhead and other factors could be included in the overtime charge.

(Amendment No. 15 to Maximum Price Regulation No. 134—Construction and Road Maintenance Equipment Rental Prices and Charges for Operating and Maintenance or Repair and Rebuilding Services—effective April 29, 1944.)

Strengthening a Strategic Interstate Bridge Deck

How panels of scrap rail were placed full width with minimum traffic delay on important bridge in the Southwest

WHEN an important strategic bridge in the Southwest needed its roadway strengthened to meet the heavily increasing traffic needs, it was found that the old timber deck could be replaced with 6-ft. panels of scrap rails, which were set full deck width with the least interference with traffic.

The old bridge deck consisted of 2 x 6 laminated redwood planks with an asphalt mix surfacing. The old deck was wearing out rapidly due to the increase in heavy type of traffic which caused rapid destruction of the timber floor. Due to the width of the structure, 18′ 1″ between wheel guards, it was found impossible to replace the deck one-half width at a time. Replacement in kind was not considered satisfactory due to the heavy type of traffic as the old timber deck was being pounded to pieces by the greatly increased amount of gravel and freight trucks which comprise 20% of the traffic. Other factors entering into the choice of type included the availability of materials, the weight of the floor system, strength and stiffness of the floor system and the time required for construction.

It was decided to replace this deck with a reinforced concrete slab and bituminous wearing course supported on the original steel stringers. Thirty-lb. scrap rail was placed transversely the full width of the bridge at 6-in. centers. A concrete filler was placed between the rails to the bottom of the ball of the rail after which a 3-in. surfacing course of plant mix will be placed. Ordinarily, the replacement would have been undertaken one lane at a time, keeping one-way traffic moving across the bridge. However, special loads 10′ 1″ in width constantly used the structure, prohibiting the construction of one-half width at a time.

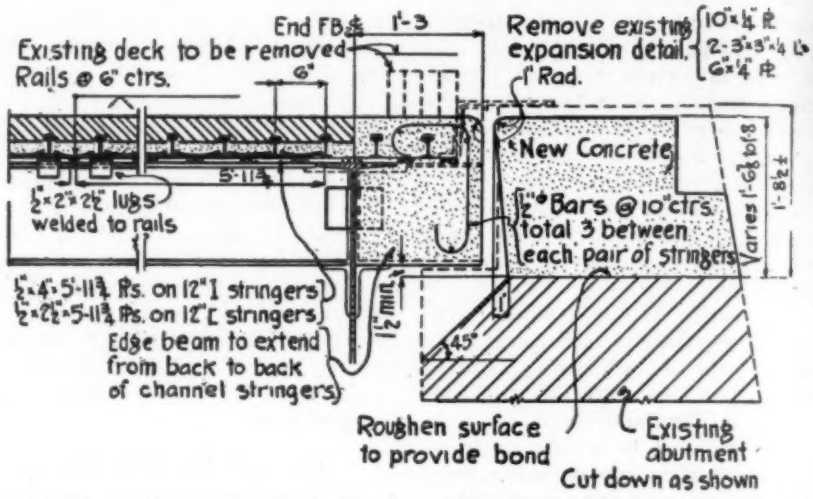


Fig. 1. Cross section through old floor and new, showing use of 30-lb. scrap tail at 6-in. ctrs. in place of transverse reinforcing

Bridge Open 15 Min. Each Hour

In order to minimize the delay to traffic, the removal of the bridge deck was not permitted until after the railroad rail panels were fabricated and ready for installation. The contract special provisions required, in order that inconvenience and delay to public traffic might be kept at a minimum, that not more than 30 calendar days should be allowed for removing the bridge deck and placing the railroad rail panels. During this period, the passage of public traffic through construction could be stopped for the first 45 minutes of each working hour to facilitate construction operations. For the remaining 15 minutes of the hour, the bridge was to be opened to the free passage of public traffic.

The temporarily exposed rail is 7 in. lower than the old floor surface, thus necessitating a temporary wooden ramp to facilitate the passage of public traffic through construction operations.

The advantage of this type of deck in addition to the saving of critical materials is shown by the considerable saving in traffic delay and inconvenience as the widening units were being pre-fabricated and hauled to the site. The Contractor was re-

(*Continued on page* 97)

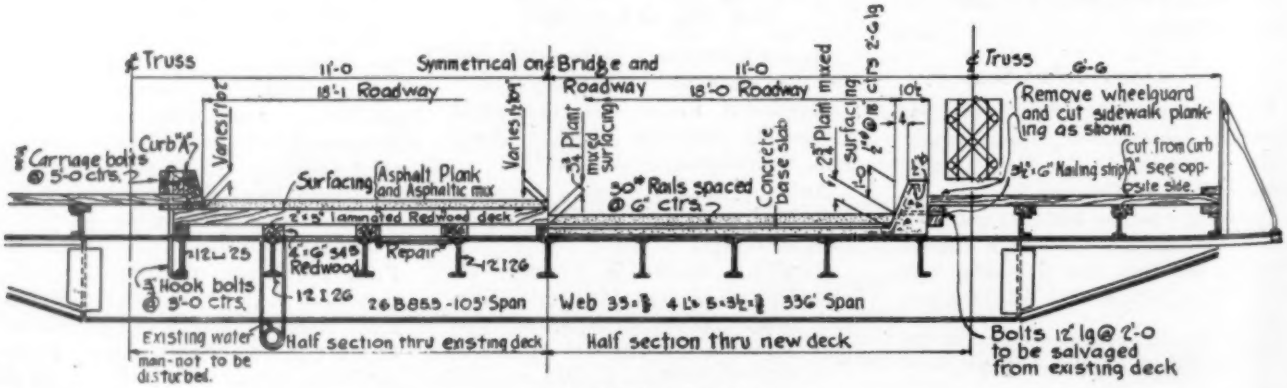


Fig. 2. Details of new floor

(Left): Excavating widening trench along the old pavement with specially designed grader blade. The apparatus consists of several scarifier teeth secured ahead of the short grader blade which removes the earth to the required width of trench. (Right): Rolling base courses in widened strip with trench roller

Widening Old High-Type Flexible Pavements

A summary of Part IV of Highway Research Board subcommittee report on Salvaging Old High-Type Flexible Pavements (subject to change before final publication). Parts I and II, on patching and on preserving surfaces for postponed reconstruction, were reviewed in March and April issues of ROADS AND STREETS.*

WARTIME traffic conditions today, coupled with modern speed and increased traffic, require that many old pavements be widened. In widening roads with a satisfactory grade and alignment, the work should be done with good material and as carefully as in the original construction.

In this class of work, a trench is excavated along the side of the old pavement to provide sufficient width and depth of base for the widened portion. Special scarifiers and grader blades have been developed to do this excavating at a very low cost. The depth of excavation will vary with the nature of the soil but should be as great as or greater than the thickness of the old pavement.

Supplement Local Aggregates

Although local native aggregates frequently will be suitable for the base courses in this widened portion, a crushed aggregate course just underneath the bituminous plant-mix top usually will be justified because of its greater stability than the local native materials. Also a penetration macadam course on the native aggregate base course will greatly increase the stability for the top course.

If local aggregates used for the base or subbase do not consist of well graded material with the voids filled with fines, it is best to make the first layer on clay soils of stone or slag screenings 1½ to 2 in. in depth. The base course then is built up in suitable layers well compacted.

If satisfactory compaction is not immediately secured, traffic should be allowed to use the widened base course several months before the final bituminous top course is placed. Such delayed method of leaving the surface incomplete, however, is not desirable on a heavily traveled pavement. The top course should be of a bituminous plant-mix material conforming in elevation, when compacted, with the crown and elevation of the old adjacent pavement, except it should be left ¼ in. higher than the old pavement.

Hot-Mix Full Depth

Due to the difficulty and time required to compact thoroughly the widened base with untreated aggregate or penetration macadam, some engineers, on narrow strip widening, have introduced the practice of constructing the *entire thickness of several courses of hot-mix*. The layers of hot-mix have the advantage of immediately taking almost their full compaction when properly rolled while hot, thus reducing to a minimum the danger of future settlement.

Spreading plant bituminous concrete in the trench in distance and compacting it with trench rollers

The edges of the old pavement should be picked and scraped clean of all dirt and loose material, and given a paint coat of bitumen to secure good adhesion of the new bituminous mixture.

Commercial trench rollers are now made for rolling the narrow strips of widened base. Also special spreading boxes have been developed for spreading the different layers of aggregate and mixtures.

Correcting High Crown

Where a high crown is to be corrected in the old road, the hot-mix top course of the widened strip is permitted to extend in a wedge shape (feather edge) out upon the old pavement. If a new overall top is not to be built immediately, frequently the whole surface as widened is given a treatment which will aid in further sealing the old and new portion and producing a uniform appearance.

Often resurfacing is combined with widening the old pavement in which case the one or more layers of resurfacing, as described in Method III*, are placed over the full width of widened pavement. Various combinations of different thicknesses of courses are used to fit the width, crown, roughness and strength of the old road being salvaged.

Section III of this report on "Substantial Resurfacing of Old Pavements Where Reconstruction is Not Anticipated," is not included in *Roads & Streets'* series.

Timber Available for Essential Uses

Specified sizes of seven species of American woods have been listed by the War Production Board as "materials available in excess of current demands."

Issue Number 12 of *Material Substitutions and Supply List* which is published as a guide to the current relative availability of important materials, classifies commodities in three groups:

Group I—Materials which are insufficient for war plus essential industrial demands within the limits imposed by existing administrative controlling orders.

Group II—Materials of which there is at present *sufficient* to meet war demands plus essential industrial demands within the limits of existing controlling orders.

Group III—Materials which, except for local shortages, are readily available for essential uses. Materials which should be used wherever possible in place of those in Groups I and II.

Lumber which falls in Group III as of April 15, was given as:

"Western red cedar, timbers;

"Pecky cypress, timbers;

"Douglas fir, dimension (3 in. and 4 in. thicknesses only), timbers;

"Western hemlock, dimension (3 in. and 4 in. thicknesses only), timbers;

"Western larch, dimension (3 in. and 4 in. thicknesses only), timbers;

"Southern pine, dimension (3 in. and 4 in. thicknesses only), timbers;

"Redwood, timbers."

Tests on Night-Seeing Value of Reflecting Planes in Pavement

By EUGENE C. BINGHAM
Professor of Research in Chemistry,
Lafayette College, Easton, Pennsylvania

IN RECENT peacetime years some 40,000 traffic deaths have occurred in a single year, according to National Safety Council figures. The accident rate per vehicle-mile is higher for night than for daytime travel. A third of these deaths, or about 13,000 annually, are of pedestrians—deaths in which lack of visibility at night or in fog often plays a part. Closely connected with the visibility problem is the menace of glare, and related but not so closely is the problem of skidding arising from slipperiness.

The foregoing facts are well known to engineers and officials, yet far too little progress has been made in building safety into the highways and streets. In fact, control of the quality of the highway surface from the standpoint of illumination has been utterly neglected.

How We See at Night, Fig. 1

The reason for poor visibility of a pavement ahead of the headlamps isn't lack of light, but lack of light that **reflects back to the driver's eye.** This fundamental fact of illumination was first brought to the wide attention of engineers in the development of reflecting-plane-white-cement curbs, now in use in many states. The reflecting plane idea has worked successfully in curbs. It can be made to serve equally well in the pavement surface itself.

The reason a pavement lights up poorly ahead of the driver is that it has a comparatively smooth surface and that surface not oriented so as to reflect the light back to the driver. A large part of the light reflects onward, becoming troublesome glare to cars approaching from the opposite direction. The light beam striking a spot, say, 300 ft. ahead of the car (Fig. 2) does so at an angle of roughly 0.5 degrees, and the meager light that does reflect back has only about 0.01

Fig. 1. In this photograph a parked car without lights is shown at the left on an asphalt roadway. Its lamps and plated parts are illuminated by lights of an oncoming car. The man at the right, dressed in dark clothes, is only dimly seen except for hands, white cuff and glasses. Eight bright tin cans serve to define five test panels, each 6 in. wide and 42 in. long.

Nearest panel (not visible here) painted with black enamel, appears blacker than the roadway.

2nd panel was reinforced concrete (with reflectors later arranged in echelon).

3rd panel painted with white enamel paint.

4th panel similar to the second except that reflectors were not in echelon and alternate reflectors were made of brass strips plated with chromium; strips carefully placed before casting so they would be firmly held in a position to focus light. Intervening reflectors painted with white enamel paint.

5th panel painted with black enamel paint (also not visible here).

The results are that the black enamel cannot be seen. Reflectors in echelon painted with white enamel are bright and pattern can be seen. Metal reflectors are the brightest and after over two years in place they are still in good condition.

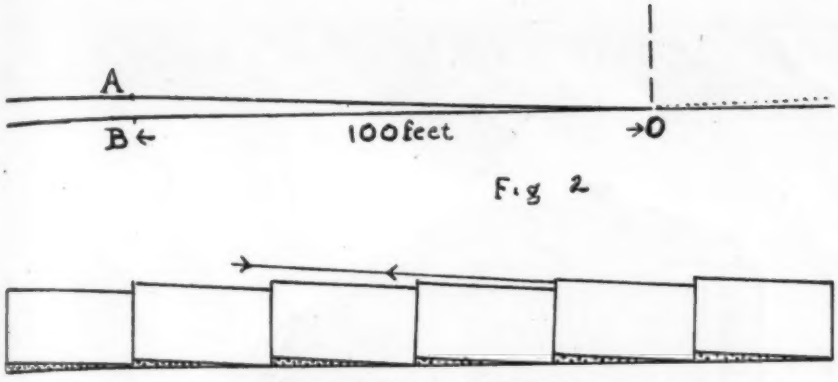


Fig 2

Figures 2 (above) and 3 (below)

per cent of its original intensity. What is needed is a controlled means of creating greater reflection back to the driver which will at the same time be satisfactory from the standpoint of durability, skid resistance and freedom from dangerous or disturbing defects.

Reflecting Segments

Following is a suggestion which it is believed would give the driver greatly increased pavement illumination without in any way altering the lamps on the car. Suppose that we imagine a series of bricks to be laid on a level foundation, each one being tilted at 0.5 degree (Fig. 3), the longitudinal ends of the "bricks" or segments being light in color, hardened and enameled. The lights of an oncoming car at 300 ft. will just graze the long sloping planes but will directly strike the short, nearly vertical reflecting planes. Thus the light will be returned toward the driver, who will see a large area of pavement, elliptical in shape, brightly illuminated. Due to multiple reflections and other causes to be discussed later, the intermediate distances receive sufficient illumination—the important thing being the possibility of detecting danger as far ahead as possible.

By having a surface with reflecting planes only ½ in. wide and arranged in a carefully designed pattern such as that shown in Fig. 4, it is possible to keep the tire of the car resting continually on the ends of the long sloping planes and thus avoid the possibility of vibration or hum. This can easily be demonstrated by getting what we may call a "tire print" obtained with a smooth tire (Fig. 5), which was made by laying down some carbon paper on a pavement of such formation after covering with white paper and driving over it.

Reflecting Plane Section Under Test

At Lafayette College for two years samples of concrete pavement with reflectors have been under test using service conditions. The reflectors were formed on the surface of the concrete when originally laid except in one case where the reflectors consist of imbedded chromium-plated brass strips. The test areas are "buried" to be flush with the surface of the macadam highway.

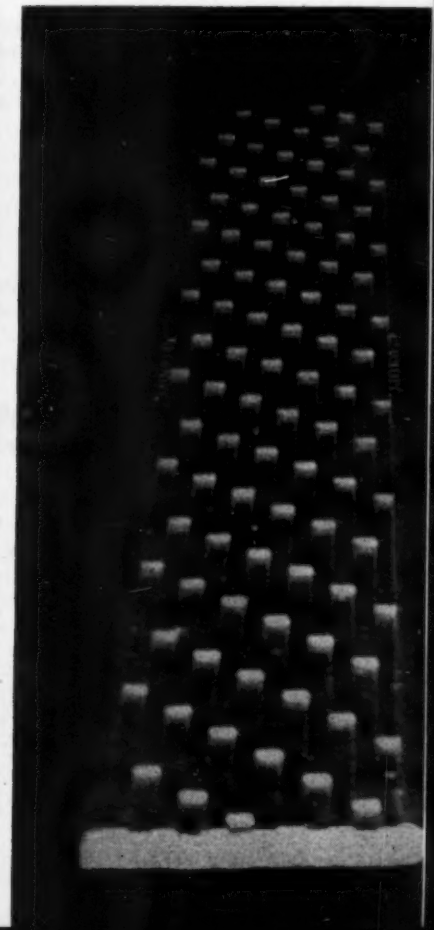
Both types of construction are still effective and have not required cleaning or repairing, except for a coat of paint on the cement reflectors.

The cement reflectors are initially less expensive, but also less effective. Fig. 1 shows three types of experimental construction set in a 6 in. x 12 ft. area between two rows of bright tin cans. The nearest bright area, 4 ft. x 6 in., consists of cement reflectors set in echelon. Just beyond is a portion of the pavement recently given two coats of white paint, and beyond that is a 4 ft. x 6 in. block with chromium-plated brass reflectors. The most striking fact is that the freshly-painted white surface is so nearly the hue of the black macadam. This is due to the high reflection away from the camera. The cans and the car in the distance all emphasize the importance of high reflecting surfaces.

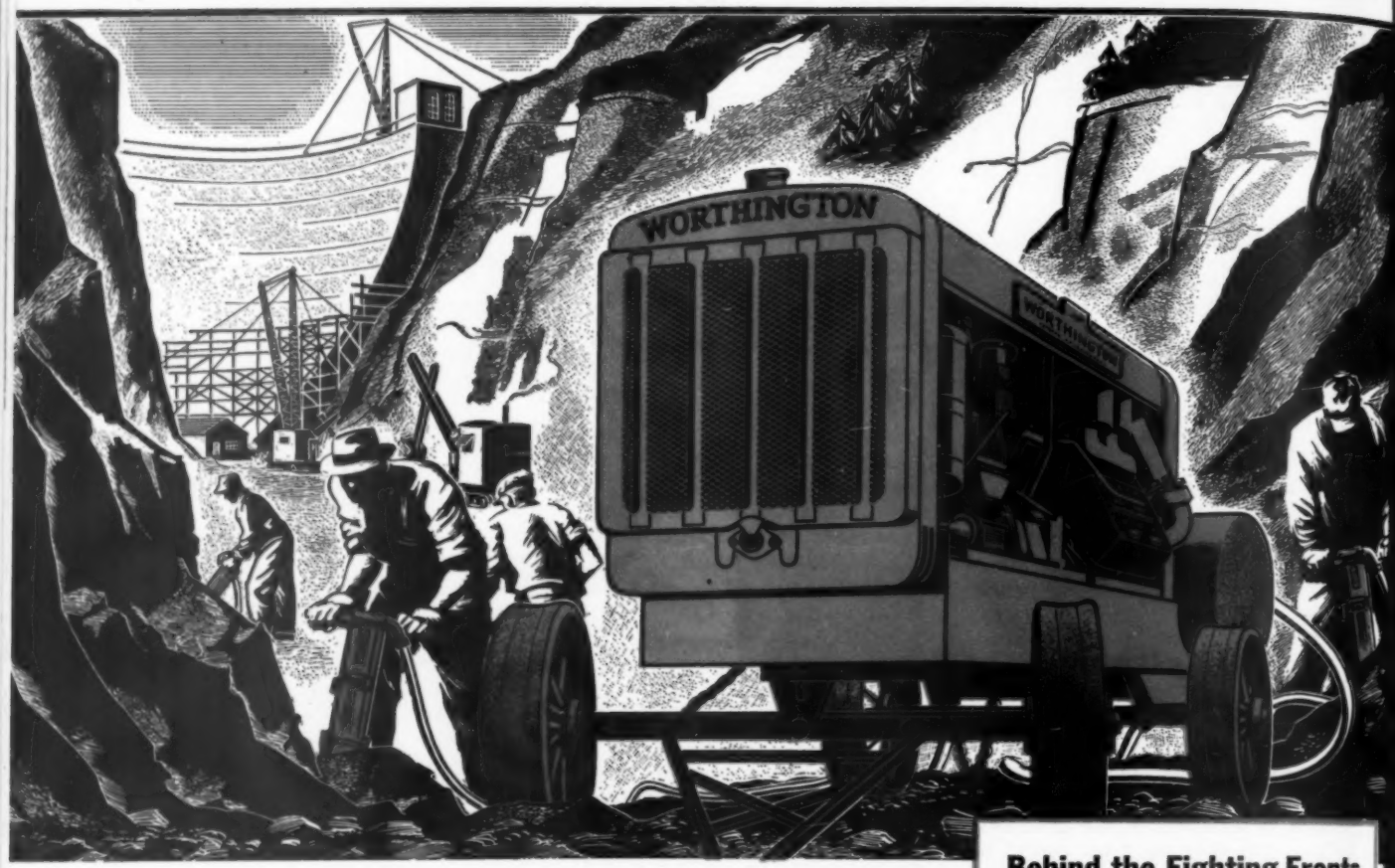
In Fig. 7 there is shown the result of an early test made on the campus of Lafayette College on a macadam pavement. Using passenger car headlights at 50 ft., four different objects were laid side by side on the pavement and photographed: (A) At the right a board 4 ft. x 6 in. x 1 in. planed, painted with several coats of white paint; (B) next to it a concrete

(Left below): Fig. 4. A cast iron block, showing 12 ranks of reflectors arranged in echelon so that a tire will at all times be resting on several prongs as proved by the tire-road print Fig. 5. The reflectors are each one-half inch wide and ¼" high. In addition to the twelve ranks of reflectors, a ¼" beveled border is shown on either side. Several coats of white enamel paint have been applied

(Right below): Fig. 5. This block was illuminated in such a manner that the reflectors would be able to throw back the light as does also the end of the block, although the latter fact is of no particular interest. The contrast in brightness between the reflectors and the long sloping surfaces is very great, but it would be much greater as the angle between the light beam and the plane of the pavement block approached 0.5° when the bright reflections from the reflectors would merge



TO TAME A POST-WAR FLOOD



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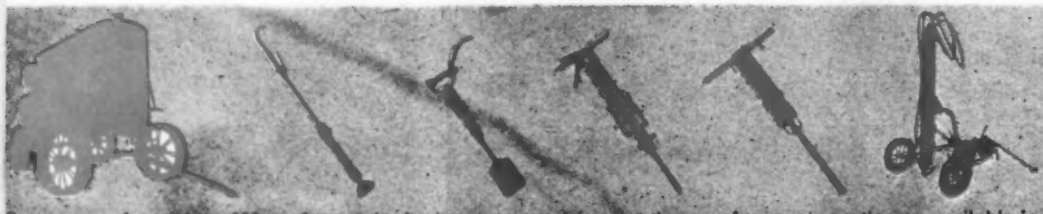

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block 4 ft. x 6 in. x 2 in. with 16 ⅛-in. reflectors, the surface of the block being painted with several coats of aluminum paint; (C) A board similar to (A) but painted with several coats of black enamel paint; and (D) a block of concrete with reflectors like (B) except that it was painted with highly reflecting white enamel paint. In the first place, it is observed that the highway itself shows numerous lights and shadows indicating inequalities not ordinarily observed. The white board (A) is to our surprise considerably darker in hue than the black highway, because the latter is uneven enough so that surfaces return the light. The brightness of (A) and (C) and that of (B) and (D) are hardly to be distinguished, proving that the very great difference between (A) and (B) is not due to the paint used but much more to the presence of reflecting surfaces. It is very important to observe from this test that a smooth horizontal surface painted with white or black enamel paint are both alike nearly invisible. The building at the left is scarcely visible, but a sign at the right is illuminated well from the car because of its good orientation. But two windows above here (B) or (D), the entire highway would be highly lighted, but since the light would be evenly distributed, there would be no glare from the motorist's own headlights. Shadows would be exceptionally dark which would be of importance in the case of light colored objects. Pools of water or ice on the highway would appear black because reflecting like (A).

▼

Crane Mounted on Used Motor Vehicle May Be Priced as One Unit

A heavy-duty crane or shovel, designed for construction work and operated by independent power, and a used motor vehicle on which it is mounted may now be priced as one unit, providing the value of the crane or shovel is greater than the value of the used vehicle upon which it is mounted, the Office of Price Administration announced April 25.

Previously, the used vehicle was priced under the regulation governing sales of used commercial motor vehicles, while the rest of the construction unit had to be priced under provisions of the regulation that would apply if the machinery were unattached.

To simplify pricing of this type of construction equipment, this action provides that the price for the entire unit (if the value of the crane or shovel is greater than the value of the vehicle) shall be priced under the machinery and parts regulation (MPR 136). The action is effective April 29, 1944.

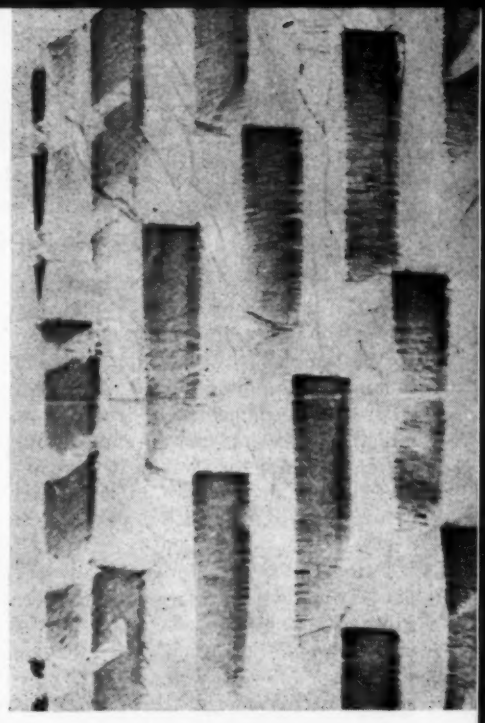


Fig. 6. Print made by the tire in rolling over the block pictured in Fig. 4, using a sheet of white paper with carbon paper beneath. This shows tire was bearing on some ten of the ranks of reflectors and that there is little opportunity for vibration. The prints of the prongs at the sides show white areas at regular distances, due to the edges of the tire not having been worn smooth

In determining whether the value of the crane, or shovel, is higher than the value of the used vehicle, the prices to be used are:

(1) For the crane or shovel: The maximum price for the crane, or shovel, at the time of sale of the combination by the present seller.

(2) For the used vehicle: The maximum price, at the time of sale of the combination by the present seller, for the bare used vehicle as though it were standard and without any extras, alterations, or other improvements.

If the value of the used vehicle is higher than the value of the crane, or shovel, the pricing of the unit remains unchanged. That is, the used vehicle is priced under the used commercial motor vehicle regulation (RMPR 341) and the crane, or shovel, is priced under the machinery and parts regulation (MPR 136).

(Amendment No. 3 to Revised Maximum Price Regulation No. 341—Maximum Prices for Used Commercial Motor Vehicles—effective April 29, 1944.)

Action Soon on New Road Bill

Additional testimony before U. S. House Roads Committee further spotlights importance of wise federal road program in after-war development of Nation

AT the conclusion of hearings, May 2, on Federal highway aid bill (HR 2426), Chairman J. W. Robinson of the House Roads Committee announced that the Committee would immediately draft a new bill incorporating many suggestions made by those testifying. It was expected the new bill would be placed before the House and Senate without delay.

For a time it appeared that the press of business confronting Congress, with general elections in the offing, would make it questionable whether a highway bill would be considered at this session. However, with tacit approval given such a measure by President Roosevelt, and with General Philip B. Fleming, FWA Administrator, and PRA Commissioner Thos. H. MacDonald strongly urging the necessity of a large-scale postwar highway program, observers believe that favorable action will be taken soon.

Panorama of Nation's Huge Road Needs

Never before has such a mass of information been presented the House Roads Committee as has been accumulated during the last few weeks (Roads and Streets, April, 1944). Most state highway departments were represented in person, submitting detailed summaries of road needs. Representatives of agriculture, labor, industry and numerous members of Congress joined in testifying in support of prompt Congressional action.

As a result of these hearings there was given to the Committee for the first time, the story of highways in relation to the nation's economic needs —a step which lifted Federal highway aid from the category of ordinary Federal authorization bills. PRA Commissioner Thomas H. MacDonald pointed out that the legislation proposed "is not temporary, but will mark the progress of road construction for the next quarter of a century."

Through testimony of Charles M. Upham, engineer-director, American Road Builders' Association, it was shown that highway construction and usage are fundamental to full employment and prosperity. It is believed by many that without emphasis on economic needs Congress would not be thinking in terms of large-scale highway construction.

While differences of opinion were registered on specific provisions, due to the wide range of public interest served by highway transportation, the testimony on fundamental issues was, with one exception, in solid accord with the purpose and principles of the proposed legislation. (Exception: representatives of the Brotherhood of Locomotive Engineers opposed the principle of federal highway aid.)

Employment Question

General Fleming, who has long waged a campaign to get the blueprints ready, told the Committee that adoption of such a measure would be a vital action in eliminating the need for made work. He said this measure "is an effective step at this time because it puts into effect one of the recommendations of the Baruch report, and that is to have a shelf of public works now."

The American Federation of Labor, endorsing H.R. 2426, described American highways as "antiques," and also emphasized the opportunities offered by road construction for postwar employment.

Using the number of persons employed as a yardstick to measure the "road needs" program (estimates in dollars are subject to variation due to unpredictable wage and price changes), Commissioner MacDonald recommended a total program of 1,057,000 man-years for construction. This is based on the average program for the 12-year period, 1933-1942, plus an increment of one-third to restore the lag of the war period.

Amount and Apportionment of Funds

One group (ARBA) suggested a larger program, emphasizing the employment which road projects would provide, while the American Farm Bureau Federation expressed the opinion the proposed authorization was too large.

After tracing the development of Federal aid, Mr. MacDonald declared that a highway program of at least $2,500,000,000 per year should be carried on for 12 years.

During previous hearings, R. H. Baldock (Chief Engineer, Oregon) suggested on behalf of the AASHO Executive Committee that H.R. 2426 be modified to allot 70% federal aid for primary and secondary systems, under the traditional formula, and 30% to municipalities, according to population. Of the 70% allotment, 25% would be available for secondary and feeder system.

Concurring, Commissioner MacDonald advised the Committee that such a division of funds would provide $450 million for the federal aid sys-

Major Wilburn C. Cartwright, former chairman U. S. House Roads Committee, visited familiar haunts when he dropped in on the recent hearings. Here he is flanked on left by Congressman A. L. Goodwin, of Massachusetts, Congressman J. W. Robinson of Utah, present chairman of the Committee; Charles M. Upham, engineer-director American Road Builders' Association, and on the right by Congressman Jesse P. Wolcott of Michigan, ranking minority member of the Committee. Major Cartwright is now recuperating in his home state, Oklahoma, from injuries received in Italy as a member of AMG

tem, inside and outside municipalities; $250 million for secondary and feeder roads, outside municipalities or inside communities of less than 10,000 population, and $300 million for principal highways in urban areas, either on or off the federal-aid system.

Mr. Upham recommended slight changes in distribution, and urged a special highway projects fund, stating: "The bill should provide, on an annual basis, separate and distinct funds: federal-aid system, $500,000,000; secondary or feeder roads, $250,000,000; principal highways in municipalities, $250,000,000; special highway projects, $500,000,000.

"It should provide for the equitable allocation of all funds under legislative formula in a manner consistent with needed improvements and economic requirements. This could best be accomplished by—

"a. Allocating funds for the federal-aid system under Sec. 21 of the Federal Highway Act of 1921.

"b. Allocating funds for secondary or feeder roads to state highway departments in accordance with Sec. 21, and re-allocating such funds to counties of each state in a like manner, except that total road mileage should be used as a factor in lieu of post road mileage.

"c. Allocating all funds for principal highways in municipalities to state highway departments, on population basis in municipalities of 10,000 or more, and re-allocating such funds among municipalities of 10,000 or more within the state in ratio which population of each city bears to the total population of all such cities within the state."

The necessity for continued improvement of feeder roads in the federal secondary system was emphasized by numerous witnesses, including representatives of the National Grange and the American Farm Bureau Federation, who pointed to the tremendous social and economic benefits.

50% F. A. Urged

Further on sharing of costs, Mr. Upham said: "The bill should provide for federal participation to an extent of at least 50%, with perhaps a substantially larger share for the transition period of two years immediately following the war." Because of reduced motor revenues many of the states would not be in a position to contribute more than 25% the first year. General Fleming, who followed Mr. Upham, expressed agreement, as also did Mr. MacDonald, who reminded that if all money collected from highway users was expended on highways, there would be no need for additional revenue.

Agreement was virtually unanimous also that no mathematical formula can meet exactly the variety of local needs and conditions existing in the several states and their communities, and that some degree of flexibility in the distribution of funds within the states is essential. This need was underscored by several taxpayers' groups, including the Connecticut Public Expenditures Council, the Massachusetts Federation of Taxpayers' Associations, the New Jersey Taxpayers Association, and the Michigan Public Expenditures Survey.

Earmarking of 20% for railroad-highway grade crossings was recommended by the Brotherhood of Locomotive Engineers. Spokesmen for the National Council of Private Motor Truck Owners and the American Trucking Associations agreed that federal aid should be voted for that purpose, although the latter group testified that 20% would be too much.

Many witnesses urged continuance of the 50-50 matching plan. Among these were representatives of the

(*Continued on page* 84)

More Counties Report Post-War Plans

Still handicapped by financial uncertainties and scarcity of designers, wartime maintenance problems often requiring full attention.

Multnomah County, Ore. Writes County Engineer George W. Buck, Portland:

Tentatively, we have recommended certain needed improvements, all of which might not be so urgent as to be constructed immediately after the war but still are desirable and would be of value if built in a short time. These are: New road construction, $600,000; road surface projects, $4,000,000; redeck one of the bridges over the Willamette River, $150,000; new buildings, $600,000; a new bridge to Sauvies Island, replacing present ferry, $250,000; road-rail grade separations, $1,000,000; new bridge in Portland harbor, $4,500,000.

It is almost impossible for us to make a real post-war program because, in the first place, nobody can say how it is to be financed, and secondly, how much money we can expect, so why should we go ahead and make surveys and plans for something we may never use?

Another reason is that any Federal aid granted for county roads has, under the government regulations, been engineered and contracted for by the State Highway Department and not under the supervision of the counties.

Also, Multnomah County, under the State law, can only issue bonds for roads and bridges and not for buildings. All new buildings must be paid for out of current taxes, and all bonds must be voted for by the people of the county, so that while we may propose a large improvement of roads and new bridges that would require more funds than our annual income, we cannot do the work if the people do not approve the issue.

As you undoubtedly know, we have the Moses Plan here which involves an expenditure of $75,000,000 in Portland and vicinity. The county is asked to provide several millions for right-of-way for subways in Portland, which under the present laws it cannot possibly do. And the other projects under this plan which we can do were taken from projects that I set forth as needed and desirable in the county but which would take several years to build with our present income.

By the time the war is over, most of our equipment will be so badly worn and obsolete as to need replacing. Estimate on this is $250,000. If the post-war program does not start before another two years we will have about $1,000,000 reserve for these projects, and any additional financing will have to be through road bond issues or Federal aid.

Scott County, Iowa. From J. M. Malloy, county engineer, Davenport:

Our program will not consist of any spectacular projects. Plans in a general way will include the following:

(1) Grading where necessary and resurfacing 250 miles of secondary roads with gravel or crushed rock, $315,000.

(2) Grading 25 miles of county trunk roads and resurfacing with stabilized base and cutback asphalt, **$168,750.**

(3) Replacing 25 small bridges, $375,000.

(4) Replacing 2 bridges, $115,000.

(5) Building a central county garage in Davenport, $100,000.

Hillsborough County, Fla. Reports J. K. Merrin, County Engineer, Tampa: This county has over 1,700 miles of improved roads and streets under maintenance; some 800 of various types of hard surfaced paving and 900 of graded-and-drained dirt roads partially stabilized. There are some 300 wooden bridges varying in length from 10 to 600 ft. to be continuously repaired. A large percentage of the paved roads were constructed prior to 1930 on a bonding, paving splurge, and maintenance since that time has never been adequate.

The majority of the paving done has a bituminous top, so we are faced with much resurfacing. This year we

Ideal Type of Post War Project

This is Groveport Road, Franklin County, Ohio (near Columbus), of which County Engineer Allan Slade writes:
Length—0.91 miles. Old pavement consists of 15-ft. bituminous concrete surface course with 2 ft. 6 in. concrete edge strips on each side. Picture shows sharp, flat curve on this strip of road. New road with 22-in. bituminous surface course is to be relocated on old traction company right of way to the left of the pole line, as shown in dash lines. Right of way has already been procured

will resurface about 50 miles, or about an average. This is an agricultural county and all our roads are important to the general well being of the public.

In addition we have two major air bases with their subsidiary encampments scattered over the county, which give all our roads severe usage. Some 100 miles of the old paving has deteriorated under the heavy traffic and are of insufficient width for intensive use. These should be rebuilt and widened from present 15 and 16 ft. to 22 ft. or wider.

Due to the heavy bonded indebtedness for original paving, all gas tax revenue will be needed for the next 10 or 12 years for retirement of bonds, which will leave only a property tax for the county to rely on.

Recognizing the seriousness of conditions, a non-profit corporation was formed for Hillsborough County, financed by the County Commissioners, City of Tampa, and individuals of the Tampa Chamber of Commerce for development of all phases of post-war reconversion and development.

Committees were appointed dealing with various phases of the county's needs and possibility of financing, with the idea of setting up a concrete plan and drawing necessary legislation for operation and financing. When this study is completed the county will start putting our plans on paper, and as the organization is functioning we should be able to start this work soon. The extent of our program will be limited entirely by the financial ability to carry it on.

Chippewa County, Mich. From Louis F. Levin, county engineer, Sault Ste. Marie:

We are handicapped, as well as every other public agency, for lack of engineers and survey crews. However, we have made up for the Public Roads Administration a $2,000,000 program covering five years. Of this we have plans that could be used on 54 miles but which we will further work on in the meantime.

The PRA questionnaire was answered as requested, but it does not tell the story because we could not get enough help here to spend the sum indicated.

Hennepin County, Mich. Writes W. E. Duckett, county highway engineer, Minneapolis:

We are working on plans for our routine road improvements which will take all of our regular highway construction funds amounting to about $100,000 per year.

We are considering a larger program, including three new highway bridges over the Minnesota River and two railroad grade separations on which to apply Federal funds if and when they become available.

Alameda County, Calif. Reports Wallace B. Boggs, county surveyor, Oakland:

During the last session of the California State Legislature $1,500,000 was appropriated to counties for preparation of plans and specifications for post-war highway contracts. Alameda County's portion is $92,720. This office has submitted to the state highway a partial budget amounting to $67,520, which has been approved and engineering work started. Work is now under way on a supplementary budget covering the remaining $25,-200 allocated.

The approved partial budget, with cost estimates, is as follows:

Road Construction

Lewelling Boulevard, from the East Shore Highway to Route 50	$ 100,000
Crow Canyon Road, from Route 50 to the County Line	195,000
Marsh Road, from Alvarado to Jarvis Road	103,300
Alvarado-Niles Road, from Alvarado to Niles	147,600
Altamont Pass Road, from Greenville to the Mountain House	81,000
Lake Chabot Road, from Route 50 northerly for 1.5 mi.	50,000
TOTAL	$ 676,900

Bridges

Crow Canyon Road, four r/c girder type	$ 145,000
Hopyard Road, three r/c girder type	201,000
Santa Rita Road, two r/c girder type	141,000
Marsh Road, one r/c girder type	40,000
Niles Canyon Road, one r/c girder type	80,000
Bay Farm Island, single-leaf bascule with approaches	710,000
TOTAL	$1,317,000
GRAND TOTAL	$1,993,900

Toledo Architects Study Lake Front Development

Recently a committee of architects began drawings on studies of proposed redevelopment of Toledo's business section and its river frontage from Anthony Wayne Bridge to Maumee Bay. The project is sponsored by the Toledo chapter of the American Institute of Architects. Completed drawings are to be presented publicly as general suggestions for civic development of Toledo, O.

Gas Consumption 1941-43—The net amount of motor-fuel taxed in 34 states for 1941 was 15,310,361,000 gal. In 1943 the amount was 10,086,-571,000 gal. or a decrease of 34.1 per cent.

Michigan Counties Report $225,000,000 Post War Job List — 11% Blueprinted

THE difference between a mere list of after-war jobs needed and a list of such jobs blueprinted can be very great. This is forcefully shown by a progress report of county plans data submitted January 13, 1944, to the Michigan State Planning Commission. Answering a questionnaire on estimate of "needed work," without reference to funds, these figures show $14,711,000 in county road and bridge plans definitely completed, comprising 11% of $136,458,000 of needed county jobs. "Plans completed" figures varied from small sums up to $5,245,000 in the case of Wayne County (Detroit). Some Michigan counties have made notable post-war progress. Chippewa County, for example, has blueprinted $703,500, or over half the post-war work compiled; Kalamazoo County, $1,115,000 (of $2,230,000); Marquette County, $1,-221,000 blueprinted; Saginaw County, $1,320,000 (of $1,650,000).

Including all highway and bridge projects — county, city and state — Michigan has built up a $42,000,000 sheef of work on which plans are completed, which is also 11% of projects compiled.

Houghton County, Mich.—county crew (they're all over draft age!) building up roadway height and widening ditches to improve drift conditions

★ ★ With Road Builders in Uniform ★ ★

From the South Pacific to England and from the Aleutians to Burma you'll find them serving today . . . the thousands of road builders who've gone out from contracting firms, state highway departments, and county, city and federal engineering posts. Here is news of a few of them. More next month. Send us your items!

Syracuse Engineers in Service

The following men, formerly employed in executive engineering positions in the Department of Engineering City of Syracuse, N. Y., are now in the armed forces: **Lt. Col. Ernest C. Wood,** Headquarters, 14th Air Force, A.P.O., No. 627, % Postmaster, New York, N. Y.; **1st Lt. C. S. Slack,** O-919924, 392nd Engr. Regt., A.P.O. No. 649, % Postmaster, New York, N. Y.; **S/Sgt. J. H. Wurn,** Station No. 11, Section C, Pacific Wing, A.T.C., Hamilton Field, California. Lt. Col. Wood was employed in the Radio Division. 1st Lt. C. S. Slack was employed in the engineering department of the Syracuse Grade Crossing Elimination Commission. S/Sgt. Wurn was employed in the Mapping Division.

Georgia Contractors in Uniform

Paul Andrews, formerly executive secretary of the Georgia Highway Contractors Association, and now a Commander of the 59th Seabees unit in the Pacific Area, has been commended by Rear Admiral C. H. Cotter, Director of the Bureau of Yards and Docks, in the Pacific Division, for his work in that area.

William L. Young, Vice President Cornell-Young Co. contractors, Macon, Ga., is now a Captain. He is assigned to the Air Corps, and is Assistant Post Utilities Officer at Robins Field, Ga. He was in the U. S. Engineers Reserve and entered the Army April 25, 1942.

W. L. Young

California Contractors Have Many Men in Uniform

The following former employes of Ben C. Gerwick, Inc., contractors, San Francisco, Calif., are now in the armed services:

Joe C. Bronson, Commander, U. S. Navy (Pacific); **Ben C. Gerwick, Jr.,** Lt., Sr. Grade, U. S. Navy (Pacific); **Donald E. Newton,** Lt. j.g., U. S. Navy (Atlantic); **Roy Smith,** War-

D. E. Newton

D. B. Weaver

rant Officer, U. S. Navy (Pacific); **Donald B. Weaver,** Captain, U. S. Army (Atlantic); **Albert Harris,** Chief Carpenter's Mate, U. S. Navy Seabees (Pacific); **Lloyd Green,** Petty Officer, U. S. Navy Seabees (Pacific); **Alan Fraser,** 2nd Lt., U. S. Navy Air Force, Marine Corps, (probably Pacific).

S. E. Buchanan

Henry Teichert

A. Teichert & Son, Inc., contractors, Sacramento, Calif., have the following men in uniform:

Harvey W. Arbuckle, Capt.; Stanley E. Buchanan, Lt.; John Glide Elliott, Capt.; James R. Galbraith, Lt.; Gordon Hayward Klippel, Ensign; Henry Teichert, Lt.; Ralph Wigle.

Major T. K. McManus, a partner in the Underground Construction Co., Oakland, Calif., is now stationed at the U. S. Military Academy, West Point, N. Y., where he is teaching Army Ordnance courses. He has been stationed there since he re-entered the Army in March, 1942. He was graduated from the Academy in 1927, resigning about 1932 to work for the Puget Sound Bridge & Dredging Co. In 1936 he formed a partnership with Nelson Hyde Chick, under the firm name of Underground Construction Co.

T. K. McManus

Notes from N. J. Highway Department

We are indebted to Spencer Miller, Jr., State Highway Commissioner of New Jersey, for the following information on employees of the State Highway Dept. now in the service:

Captain Ronald Crawford, Upper Montclair Survey and Plans Office, is engineer in New Caledonia.

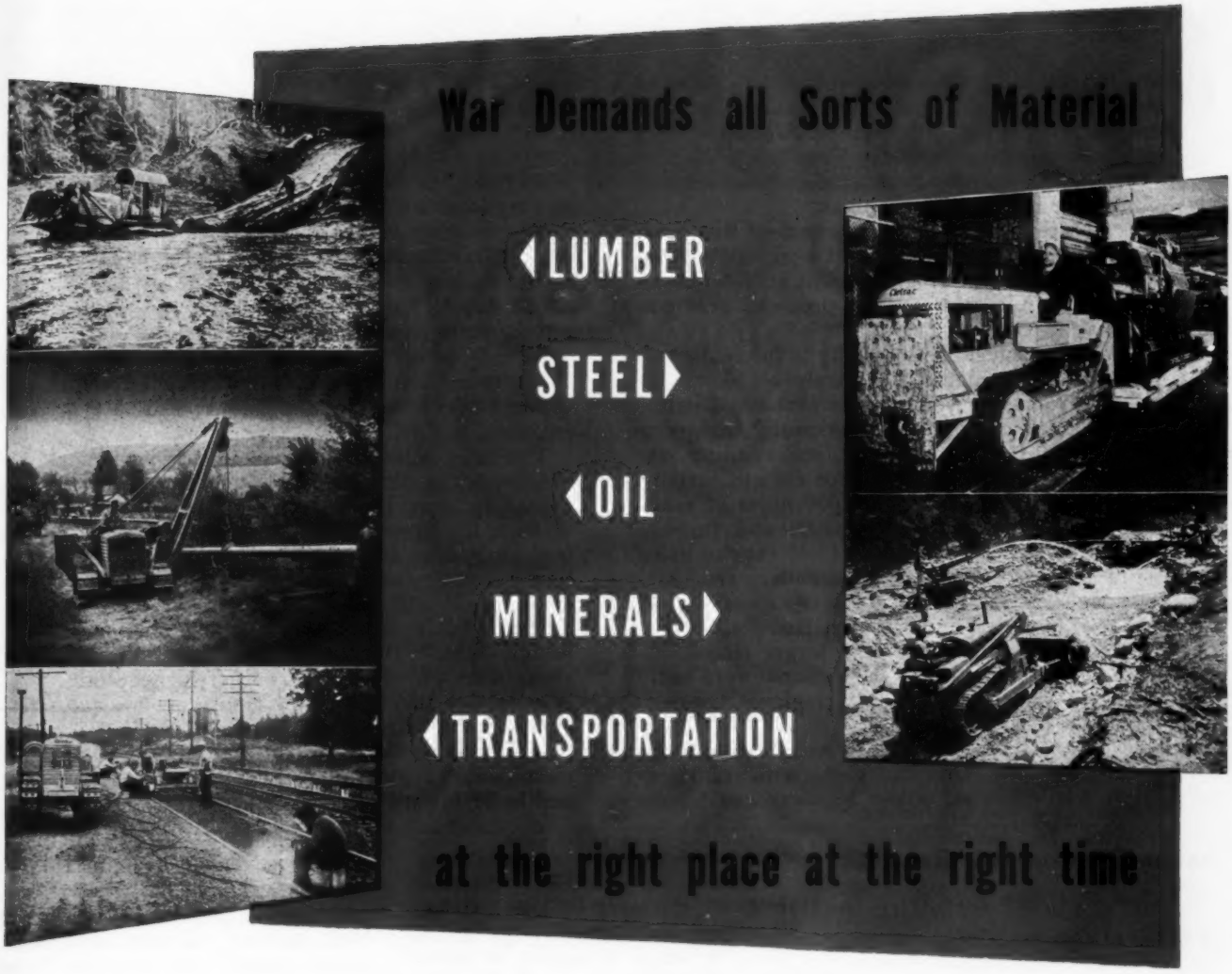
Warrant Officer Sidney Sterner, projects inspector, is on road construction in New Hebrides and **Lt. Commander William B. Dallas** has served more than a year in the bleak Aleutians.

Commander Guido F. Forster, projects engineer, is again with the Navy with sealed orders. **Captain Edward L. Forrest,** Survey and Plans Office, after many successful missions was awarded the Distinguished Flying Cross and Air Medal with 9 oak leaves.

Marvin L. Howell, chief auditor and accountant of the New Jersey State Highway Department and member of the Uniform Accounting Committee of the American Association of State Highway Officials, has two sons in the armed forces. **Captain Welling C. Howell** is in New Guinea and **Staff Sergeant Fred C. Howell** is instructor in aerial gunnery at Tindall Field, Florida.

Three of the Carrs in the service are sons of John T. Carr, maintenance supervisor, who has been assigned on involved problems in all parts of the state during his long tenure. They are: **John T. Carr, Jr.,** with the Seabees in South Pacific; **Joseph P. Carr,** Air Corps; **Robert P. Carr,** Tank Division.

Lt. Col. H. J. Stark, formerly highway engineer, jr. grade, Highway Department, Cook County, Illinois, is with 7th Engineer Bn., U. S. Army, A.P.O. 5, % Postmaster, New York, N. Y. Other Cook County engineers are: **Captain James F. Kelly,** formerly highway engineer, sr. grade, is with H.Q. 369th Engineers, Camp Beale, Calif. **Lt. John G. Braun,** formerly sr. engr., is with 56th Bn. Batt. B, AAETC, Camp Collen, San Diego, Calif.



BACK of the battle lines throughout the world, Cletrac Tru-Traction tractors are helping to produce the sinews of war in sections long distances from civilization. In logging camps—on oil fields—in mines—on new highways—wherever heavy hauling, bulldozing or earth moving must be accomplished, Cletracs are doing the job economically and dependably.

In war plants of the United States and in the industrial centers of the United Nations, Cletracs perform yeoman service in steel mills, on docks, and in warehouses, handling huge loads of war goods in process of production or shipment to fighting forces.

The Cletracs that have been working on these jobs were nearly all produced before the war began, because since war engulfed us, 92% of Cletrac production has been to meet military needs.

While we are still producing to meet the demands of war, with a large part of Cletrac standard production running into 1945 required to complete present contracts, the over-all production of Cletracs has been so greatly increased, that a substantial number of Cletracs are being released for essential civilian use. These tractors are allocated according to government regulations. Your Cletrac dealer will gladly assist you in making application for a new Cletrac if you can qualify as an essential user.

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CLETRAC REPORTS ON ITS WAR EFFORT

This folder, recently published, tells briefly of Cletrac's part in the war effort. A copy will be mailed on request.

THE CLEVELAND TRACTOR COMPANY • CLEVELAND 17, OHIO

CLETRAC *Tru-Traction* TRACTORS

INTERREGIONAL HIGHWAYS IN TEXAS

(An Editorial)

DOWN in Bryan, Texas, early this month a lot of bronzed, hard-headed road men gathered in from the plains and held the 18th Annual Highway Short Course under the auspices of the Texas A. & M. College. This is one of the outstanding road schools, rivaling that of Purdue and Michigan.

Texans like to speak out bluntly, and on this occasion the highway department district engineers, county officials, contractors and others present staged quite a debate on certain phases of the proposed post-war interregional highways.

What they were shooting at mainly is the controversial high design standards tentatively set down for interregional routes through larger centers. Limited access design, calling for numerous costly grade separations and 300-ft. rights of way, and running into the millions per mile, may be fine for certain parts of the East. But Texas with its 200,000 miles of roads has hundreds of thousands of ranchers and farmers who still live on unimproved roads. Until they're lifted out of the mud and dust and the secondary road system further developed, it isn't going to be easy to sell the state on fancy arterials through Houston, Dallas, Fort Worth, San Antonio and other larger places.

Some of the debaters at the short course were badly "het up" and hadn't read the Interregional Committee's report very carefully.

But several fundamental points were brought out by prepared speakers. One had to do with traffic capacity. A 4-lane limited access highway can handle about 1,800 vehicles per peak hour or 18,000 per day; a 6-lane, 24,000. As one Texan put it, "These roads will certainly avoid any traffic congestion in a state where 2,000 vehicles per day on roads into town is more nearly the rule."

Another point was on Interregional Highway traffic destination. Though connecting regions, these routes must finally be designed as a series of links primarily serving local traffic—which, by the way, usually wants to go *into* town rather than by-pass it. Take the 244-mile Dallas-Houston highway for example, one of the state's busiest. Only 37 vehicles a day go clear through (1939 data). Most users of this route are headed to a town or farm along the way. Designers of the proposed new Interregional route realize they had better think twice before failing to take their line smack through the middle of every town of 10,000 or more en route.

The third point brought out in the short course discussion is the obvious one that every city must take a leading part in designing the post-war arterials through it. Experts from afar can contribute specialized knowledge and advanced ideas, but when the Interregional System takes form—and it surely will—its development will certainly have to be carried out on a flexible basis. But who knows how high to raise the design sights? During the 20's thousands of miles of roads were paved to fence-corner-turn designs, obsolete the day they were built and economic and safety handicaps until replaced.

It's always been a race with the auto. Rural and metropolitan regions alike must keep an eye on Detroit and build toward a new age of motor transportation.

Action Soon on New Road Bill

(Continued from page 78)

Chamber of Commerce of the U. S., the American Farm Bureau Federation, the several taxpayers' groups, and highway officials of New York, Connecticut, New Jersey and Massachusetts.

Commissioner MacDonald presented estimates of state highway receipts and expenditures showing that 17 states would have to secure additional funds to take up federal allotments in 1945 on a 75-25 ratio, and 39 states on a 50-50 ratio. In 1946, the number of such states would be 22 and 44 respectively (indicating progressive exhaustion of wartime unexpended state balances).

Interregional System Endorsed

Joint federal-state designation of an Interregional system of highways (about 34,000 miles) was endorsed by a great majority of the witnesses. The consensus was that it would make possible an orderly development of a network of main arteries.

While agreeing to the necessity for development of arteries linking population centers, farm spokesmen took a stand against overemphasis of urban problems, and requested that full consideration be given to the needs of the secondary and feeder roads directly serving the farm population.

Commissioner MacDonald reviewed in detail the work of the National Committee on Interregional Highways, of which he served as chairman, and which recommended that Congress provide authority for the joint designation of such a network by the states and federal government.

The Interregional routes as selected for improvement to high standards of design comprise approximately one per cent of the nation's total road mileage, but would carry up to 20% of the total volume of urban and rural traffic.

Road surfaces on these main arteries are such that they will require replacement at the rate of approximately 1,100 miles a year, but generally they are inadequate in width, curvature, sight distance and other conditions affecting their capacity and safety. Because of deficiencies in loading design and horizontal clearance, only 72 of the 8,435 bridges on present rural sections of the system are entirely adequate.

Commissioner MacDonald stressed the inadequancy of the roads in the Interregional Network, and recommended that the states be encouraged to develop the system by a preferential granting of funds for interregional projects. He suggested up to 10% more for them. bringing F.A. to a 60-40 basis.

Broad Principles Required

Mr. Upham in his conclusion reminded that any legislation dealing with postwar highway construction should embody the following fundamental principles: It should:

"Be all inclusive, to preclude necessity of subsequent programs of a make-shift nature. Provision should be made for the participation of all competent highway agencies, state, county and municipal.

"Anticipate a total annual highway program of about $3,000,000,000 at all levels of government, including matching funds.

"Provide for immediate financial assistance for preparation of plans and acquisition of rights-of-way (at least $100,000,000).

"Provide for a 'Special Highway Projects Fund' to be administered on a loan-and-grant basis of not less than $500,000,000 to take care of extraordinary highway projects in metropolitan areas, improvements to the Interregional System and other such projects available to all qualified highway agencies, state, county and municipal. The amount for any one state should not exceed that state's share on a population basis.

"Provide that funds expenditure should be predicated upon approved plans and specifications and award of the contract to the lowest responsible bidder."

Equipment Maintenance

Labor-Saving Kinks and Devices in World's Largest Municipal Shop

Second of two articles on New York City's Central Motor Repair Shop

KEEPING New York City's streets clean and its garbage collected and disposed of requires one of the largest motor fleets of any city in the world. Over 3,000 diversified equipment units, including 1,500 large-capacity refuse and garbage collection trucks of special design, must be serviced and repaired. Headquarters for this work is a ten-story building at 16th Street and Avenue "C" in lower Manhattan, known as the Central Motor Repair Shop, which is operated by the Bureau of Motor Equipment and Maintenance, Department of Sanitation.

One function of this shop, that of preventive maintenance, was described in a previous article (ROADS AND STREETS, March, 1944). The other main function is that of major repairs and overhauls, a task which has been stepped up greatly since the war began. As with the preventive maintenance routine, repair work is a highly specialized procedure, geared to the magnitude of the job. It naturally centers around the truck fleet. Since trucks are mostly built to the city's own special design, with similar or interchangeable parts, any common type of repair—such as, say, transmission overhauling—becomes a mass production job, justifying the development of special methods and labor saving equipment.

Department Groupings

This place is departmentalized, as with any other large municipal shops. For example, beginning at the top of the multi-story building, the 10th floor houses the electrical shop; a spacious woodworking shop where burned or wrecked cab and body frames are rebuilt; the sign repainting shop; and upholstering work.

The 9th floor is given over to general repairs. On this floor is the broom making department, but most of the space is for truck tear-downs, motors going to the motor room several floors down, and salvageable parts to other floors for welding, machining, etc.

More Departments

The 8th floor is for tinsmithing (radiator and battery); battery rebuilding and charging; a large blacksmith shop; and, adjacent, a "line" for repair work necessary on the City's 72 Snogos and plow aprons; equipment for all kinds of straightening and forcing of body parts etc. (Photos No. 10). Also a highly specialized and equipped department for performing one of the large-volume routine tasks, that of repairing chains on the refuse truck conveyors. Here also is a welding room, to which the bulk of welding work is brought.

Working down, the 7th floor is for tire and tube repairs, utilizing special labor saving equipment devised from discarded mechanical units, parts and materials. Here, too, centers the upkeep of the department's 172 passenger cars.

The 6th floor is a New York City Police Department shop, where all major repairs on automotive equipment are performed.

The 5th floor is for "PM" (preventive maintenance), where 50 trucks a day are "processed" in normal times.

The 4th floor houses a large, highly specialized machine shop (40 to 50 machines), and a corner for assembly leaves of replacement springs, with the aid of a specially built hydraulic press (See Photo 15). Also on the 4th floor is the bulk of engine rebuilding, and a division for parts inspection where a stock of fast moving parts, salvaged through the machine shop, are kept for a quick call.

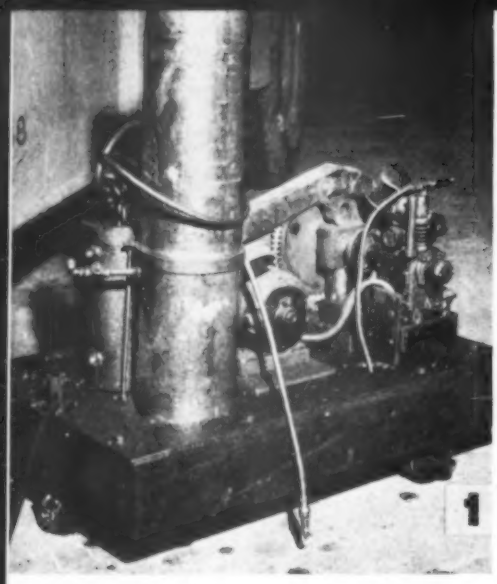
The 3rd floor is a general stores warehouse maintained by the Department of Purchase, where a vast amount of automotive parts are stored for supply, on requisitions, to all City departments.

A blacksmith shop and forging and annealing room on the ground floor complete the picture.

In Addition to Kinks Not Pictured

It would be out of the question to describe all these goings-on in de-

Motor assembly carrier (see Photo No. 2). Checking with a mechanic here are Jos. S. Plumeau and E. A. Donnelly, respectively, chief, Division of Motor Equipment, and assistant to Commissioner of Sanitation. Note hand-operated winch in front of radiator, which pulls the motor into position by means of a cable snatched at the truck frame



tail. While the techniques are for the most part standard, quite a number of special units and methods have been evolved through the years. Inventiveness is always encouraged and numerous devices have been patented by employes under City sponsorship. Joseph S. Plumeau, Chief of the Division of Motor Equipment and Maintenance and boss of the big shop, holds patents, as do members of the design staff, foremen and shopworkers. Each department, incidentally, is under a foreman, and some departments such as the machine shop also have a development engineer, working in close contact with the design or engineering department.

For example, in addition to the "ideas" shown in the accompanying photographs, there is the device for inflating ten heavy truck tires at a time to 80 lb. pressure.

A large "table" around which several workers are busy vulcanizing truck-tire tube with the aid of air-jacks which hold the tubes tightly against the heating elements. Two men, each able to patch a tube in 20 minutes in emergency and often handling 8 or 10 tubes at a time, can easily do 200 patches a day.

Various special stands for holding transmission cases and other heavy parts or units during repair operations.

Uniquely designed stand for testing hydraulic motors, consisting in principle of a combination flow-meter and test for volumetric and mechanical efficiency.

A centrifugal machine which speeds babbetting of a large volume of main and connecting-rod shell bearings.

A portable hydraulic ram used for pulling anything that can be budged with pressure up to 100 tons.

A hollow hydraulic ram designed for pulling tight pins.

And numerous special machines for the wartime salvage or manufacture of certain parts required in volume.

In short, New York City's Central Motor Repair Shop is quite a storehouse of ideas, and all in all a place certainly worth a visit by municipal equipment men from other cities. Needless to say its labor-saving ideas are coming in mighty handy right now, with the staff thinned down to two-thirds normal size by war conditions.

Joseph S. Plumeau, Chief, Division of Motor Equipment and Maintenance, is in charge of the shop, under Assistant to Commissioner of Sanitation, Edmund A. Donnelly. Wm. F. Carey is Commissioner of Sanitation, City of New York.

These "Ideas" Coming in Handy Today

1. Bearing Test Outfit

This curious contraption, made from salvage materials, is designed to trundle alongside a truck and use for checking the conditions of main and connecting-rod bearings. It is handy where high-pressure air isn't available. Operated on 70 lb. pressure, it cuts into the oil pressure system. Whether oil drips or pours is the test of looseness of bearings. The assembly consists of an air tank, oil tank, ¼ h.p. air compressor motor, and two pulleys made from ring gears. Motor plugged into wall builds up to pressure.

2. Motor Assembly Carrier

When the shop men go to pull a truck motor for overhauling or repairing the job is made easy by this shop-built carrier. The whole unit—radiator, transmission, generator-starter and all—rides in a frame designed to handle standard collection truck motors.

3. Transmission Lifter-Outer

This device (not shown in position of use) perches on the chassis frame, back of the cab and under the raised body, and enables two men to lift out the transmission. The unit is raised by reeving up a steel cable, via worm gear and hand crank. Once the transmission is raised clear, it is carried out to the side of the truck by allowing the trolley wheels to slide along the inclined rail, whence the transmission is taken over by an overhead chain hoist.

4. In Battery Dept.

Wholesale rebuilding of the city's truck batteries is found necessary today. Of course the work is broken down into more specialized tasks than is usually necessary in a smaller city. One scene shows how shop-manufactured cables are hung to dry after final painting. Battery straps are home-made. The rack was designed and built in the shop.

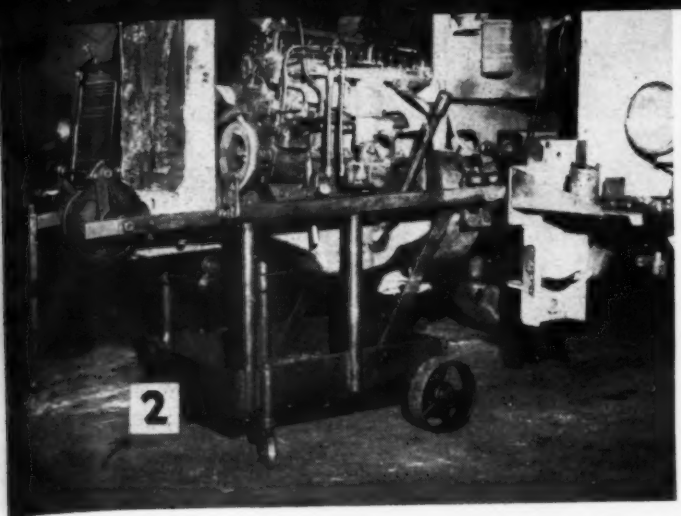
Also glimpsed is the battery charging room. After rebuilding and receiving initial charging, batteries are discharged and re-charged to condition them for service. The discharger is in the foreground. Note the layer of lime on the floor. Lime plus a coat of asphaltic cement is placed to further protect the asphalt-treated concrete floor from acid drippings.

5. Floor Cabinets for Fast Moving Parts

A step-saver is this spacious cabinet, one of several and located several repair stalls apart. It is carefully stocked with gaskets, hose connections, screws, bolts, cable, washers, and other items constantly needed in doing preventive maintenance and repairs. The closed doors are padlocked after hours.

6. Hydraulic Sleeve Puller

Designed by Carl Ottoson, assistant chief of the Div. of Motor Equipment, this unit is a "special" which has reduced to minutes the job of pulling rear-end sleeves from GMC and Autocar refuse trucks. The hand lever operates a 225-ton 2-stage hydraulic system, made from spare parts from truck systems. Hand-operated screws at either end of the frame permit raising puller to the exact height and leveling with precision.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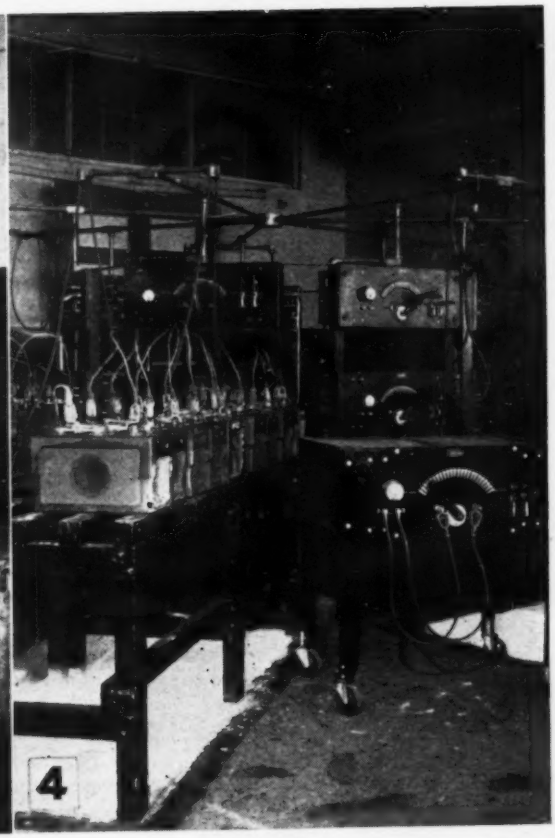
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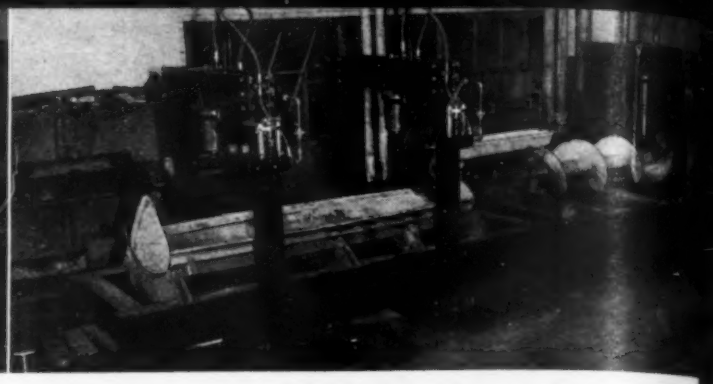


7. Hydraulic Straightening Jack

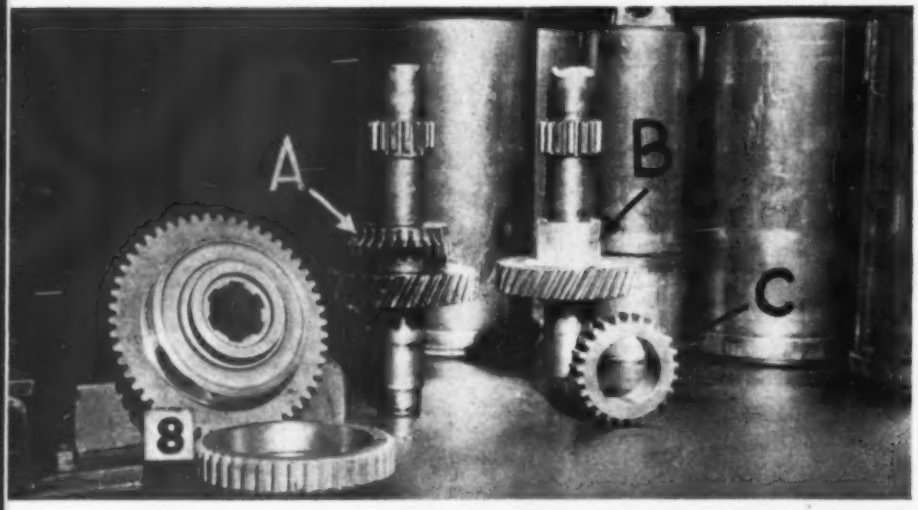
Also a strictly shop-built item is this versatile hydraulic jack, designed for all kinds of straightening, forcing off, etc. Its original purpose was that of straightening snow plow aprons, but it eases labor almost daily on such tasks as straightening snow plow arbors, forcing out broken axle ends for salvage (see photo 6 group). The outfit consists of a heavy bed-frame and three pressure frames, movable as shown. Each frame carries hydraulic jack and pump equipment of stock design.

8. Replacing Gear Teeth

When the war put high-alloy steel transmission countershafts on the scarce list, the N.Y.C. shop men immediately devised a machine shop routine for cutting or burning away worn teeth and shrinking on and spot-welding new gear rings. The rings are made in a commercial shop. Arrow "A" shows worn unit, "B" similar unit after cutting away worn teeth, "C" a ring gear waiting to be shrunk on. At left on table is substitute ring gear for another gear part. New York's 1500 trucks of closely similar design have made a highly developed routine profitable here.

9. Press for Assembling Truck Springs

The shop makes up hundreds of spring assemblies from new leaves, and replaces broken spring leaves as promptly as possible to prolong spring life. This hydraulic press reduces time and labor to a minimum.



10. Salvage Welding

The Central Motor Repair Shop does a large volume of welding, some as a peacetime routine to save money, and some where parts are now obtainable or involve long delays.

Typical welding chore added since the war is that of brazing and building up worn spring contact rings (see arrow) on GMC clutch plates, to restore total thickness. The ring is raised an amount exactly offsetting wear on the other side of the plate.

Three welded shafts which after machining will again see duty on the 45 yd. crawler wagons used at the city dump.

Safety clutch splines, before (center) during (8 at right) and after (left) bronze welding and machining —a large scale operation serving hundreds of trucks.

11. Cylinder-Head Assembly

Here is another shop unit which has paid for itself many times in labor and time saved on truck motors. Motor blocks are set along the bed, where a wheel forces out valve guides; valve seats are ground; valves ground into seats; all twelve valves, springs and retainers placed at one time; and rocker arm assembly put in place.

12. Testing Big Tubes for Leaks

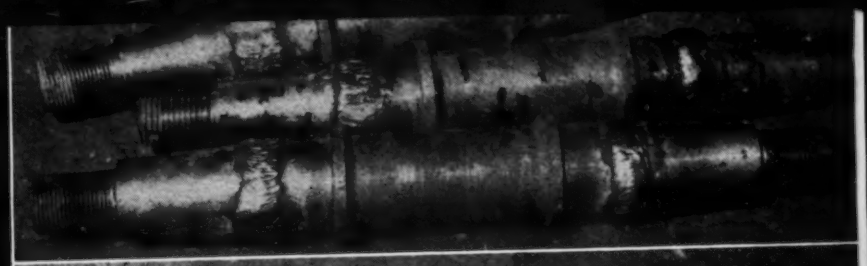
Ever try to immerse a large inflated truck tire tube? It's a mean job. This machine, rigged up from cast-off units and an old hydraulic ram, dunks a tube, forcing a bearing plate down on the tube with 90 lb. of air pressure in the ram. A tube a minute. Another time saver.

13. For Vulcanizing

This is an air-operated press designed specially to hold tubes in proper position and apply pressure while preparing tubes for vulcanizing.

14. Labor Saving on Broom Making

Another of New York's special volume needs which lend themselves

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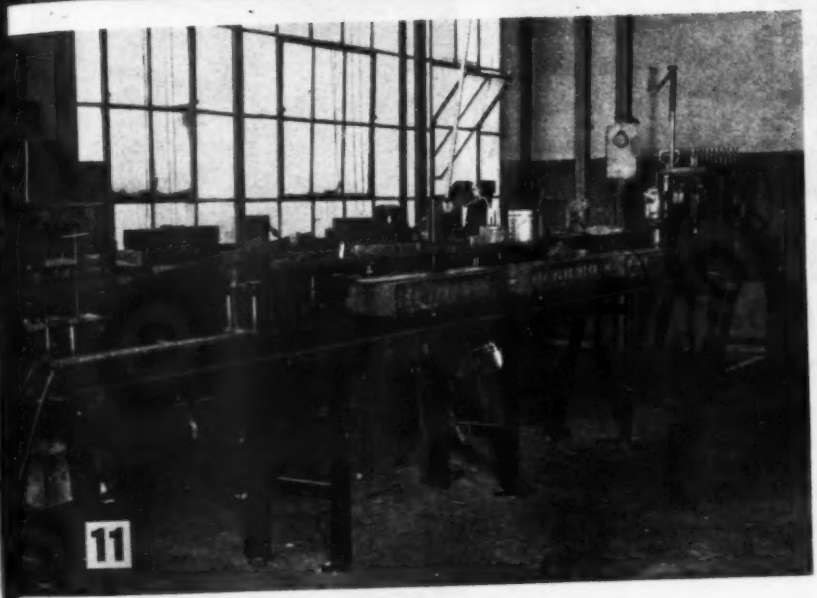
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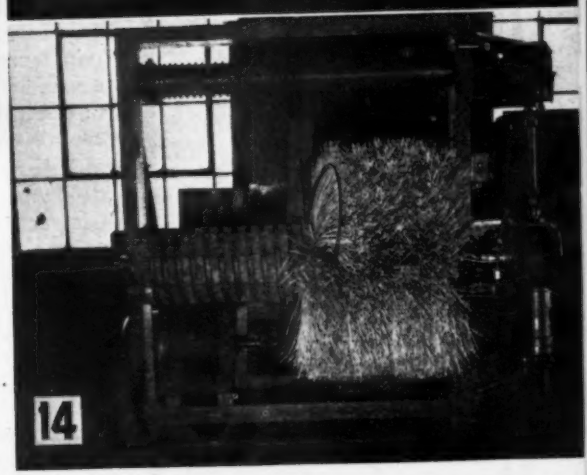
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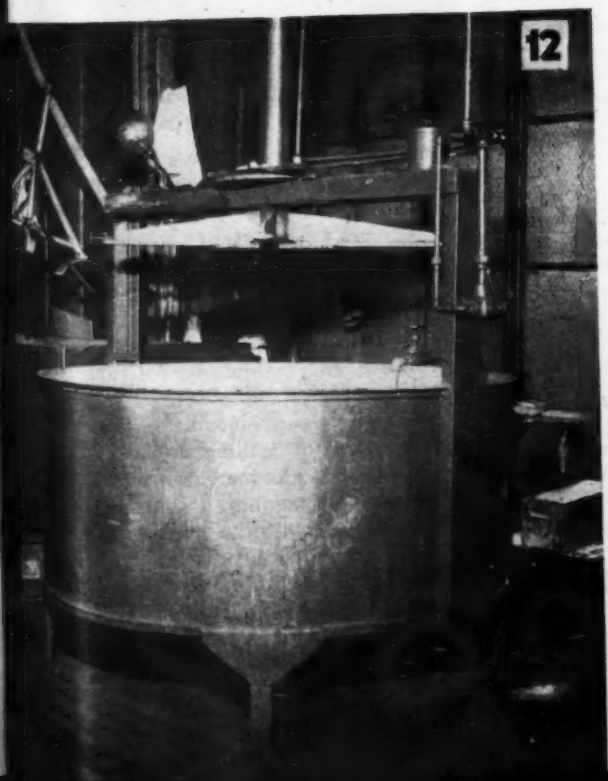
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to development of labor saving devices is that of street broom replacement. An average of 18 brooms a day must be replaced. To speed this work several broom machines have been equipped with hydraulic drives designed in the shop. Whereas it formerly took 2 men 7 hours to make up a broom, this equipment will turn one out in 18 to 21 minutes.

A snow broom machine of 1924 vintage, used for making up heavy rattan brushes, was increased ten-fold in capacity by adding a 2nd and 3rd wing with hydraulic drive. The increased productiveness is accounted for by the fact that the machine itself doesn't lose any time. Two additional workers are required. Workers in the broom shop are limited-service

men (with hernias, etc.) brought in from street sweeping gangs.

15. Starter Testers of Special Design

A test stand designed for both truck and passenger car starters. The hand operated pony brakes (upper view) is for gaging against stall specifications. The starter turns a flywheel on the same shaft as the brake and instrument panel tells operator torque, speed, etc., which he checks against the specification chart mounted also on the panel.

Another starter tester comprises two alternate flywheels, one simulating passenger car and the other truck torque conditions. It is operated by a hydraulic brake from a Plymouth car.

This equipment is part of a large electrical shop which keeps a stock of overhauled replacement units on hand. As the upward of 50 trucks daily come in for their 30-day Preventive Maintenance routine their starters are tested and adjusted, or replaced from overhauled stock.

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Reinforcing Steel Study Started

A Committee on Reinforced Concrete Research organized recently by the American Iron and Steel Institute has inaugurated a basic study of the uses of steel bars for concrete reinforcement. Membership of the committee includes representatives of 21 producers of both new billet and rail steel concrete reinforcing bars. An initial program of work covering a minimum of three years has been outlined. In general, it is planned to study the extent of any gaps which may exist in the technical data on which design regulations and specifications are customarily based. It is then proposed to initiate programs of research for the purpose of developing new test data or of supplementing existing data.

Several research projects have already been authorized.

Work is already under way on a comprehensive investigation of problems relating to the proper design of square and rectangular footings. No research work pertaining to the design of footings has been reported since 1913. A second project will involve the investigation of unit stresses permissible in the design of reinforced concrete slabs and beams. Classification of all types of deformed bars which may be developed as a result of the concrete reinforcing bar industry's purpose of developing a standard or universal type of deformed bar will be covered in a third project.

Tips on Sheave Maintenance

The following suggestions are taken from the March issue of Ropeology, a publication of the MacWhyte Co., Kenosha, Wis.

Sheave and rope must work together in close harmony. Worn grooves pinch wire rope and when the sheave and rope are not working together properly, the rope chafes the groove.

Ropes may literally wear away a sheave, especially a soft sheave, but it's no telling how many ropes the sheave will wear out first.

Sheaves (including manganese steel) must have the groove concentric with the center of the shaft and be free from roughness or burrs of any kind. The bottom of the groove in a sheave should be round and smooth.

Grooves Wear Smaller — Sheave grooves should be gauged before installation of a new rope to see that the groove is not smaller than the rope.

If it is smaller, the groove should be widened and trued up to prevent pinching of the rope.

Contrary to popular belief, a sheave groove wears smaller, not larger.

New Ropes Don't "Track" in Corrugations—Although corrugations in a sheave are caused by wire rope, wire ropes will not engage these corrugations like a chain on a sprocket.

Corrugated sheaves should be regrooved to prevent damage to new rope.

Off-Center Sheaves—On an elevator installation recently, the drive sheave and secondary sheave were removed to regroove them. Bearings were found to be worn into an oval shape. This caused the deflector sheave to wobble thereby continually changing the tension of the rope during operation.

When sheaves are removed for regrooving sheave bearings also require close checking.

Sheave Diameters—Sheaves should be the correct diameter for the size of rope used. The smaller the sheave, the less wire rope that is in contact with the sheave. Therefore, the smaller the sheave, the more unit pressure exerted upon it because the load or weight would be distributed over a smaller area. The larger the sheave, the better the service obtained, all things being equal.

Periodic Inspection Important—Experience proves that those who inspect their sheaves at regular intervals and keep them in good repair, get better wire rope service. The best wire rope for the job will not produce maximum service against pinching and filing of sheaves.

Care of Synthetic Rubber Truck Tires

Most of the larger size highway truck tires are now made with a substantial percentage of synthetic rubber. Hence the following suggestions on the care of these tires given in the supplement to the B. F. Goodrich Rubber News Letter of April 12, are particularly timely.

Present synthetic truck tires give much better performance than they did a year ago, but still are not as good as pre-war tires. Below are a few simple rules which, if followed, can result in synthetic truck tires giving reasonable, satisfactory service. They must be followed if we are to get maximum mileage from our tires and keep essential truck transportation rolling.

1. **Do not overload.** Know the Tire and Rim Association rated load for the tires you use and load your equipment so the tires will not be forced to carry more than this load per tire.

2. **Hold speeds to the victory speed limit.** High speed causes heat which in turn can cause heat blow-outs and tread and ply separation. It's the main cause of fast tread wear.

3. **Do not over-inflate.** Use the air pressures recommended by the Tire and Rim Association and do not vary these unless a thorough analysis is made of your operation in order to arrive at specific pressures which will apply to your operation.

4. **Do not operate tires under-inflated.** Check air pressures when tires are cold before every trip or at least three or four times a week. Check valve cores and replace those that leak. Keep valve caps on valves at all times.

5. **Dual tires must be twins.** Match them for outside diameter. If necessary to use a slightly larger tire on a dual wheel, mount it on the outside. Do not run a cotton tire with a rayon tire on the same dual wheel nor mount a synthetic tire with a rubber tire on the same dual wheel.

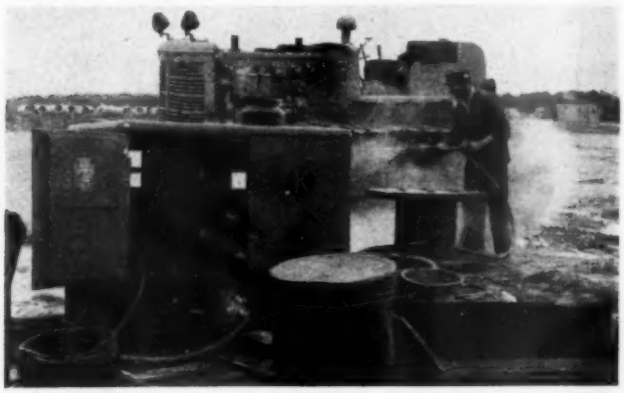
6. **Drive carefully. Start and stop slowly.** Anticipate stops so brakes can be put on gradually. Drive around breaks in the pavement. Do not swerve on and off the pavement.

7. **Correct mechanical irregularities.** Watch brakes, wheel bearings, alignment, springs, and rims. When uneven tread wear shows up, find the cause at once and correct it.

Following these suggestions day after day will many times save man hours because it will prevent breakdowns on the road. It will help to keep your trucks running and reduce tire expense, and it will save rubber and cotton or rayon.

Scenes at Airport Contractors' Field Shop in Georgia

Here's where H. E. Wolfe Construction Company kept its 90 earth moving units in repair on Warner Robins Air Depot runway extension contract near Macon, Ga. Each stall is "one wagon deep" (more or less)



A high-pressure steam cleaning outfit was kept busy on muddy under gear as well as on parts in connection with repairs

(Left): Worn dragline teeth were given new manganese tips in accordance with approved salvage practice

Wolfe's Supt. D. L. McHugh

Several dozer aprons were almost completely rebuilt in the Warner Robins job, aided by a handy acetylene cart outfit

(Left): Welding worn swing-gear teeth from one of Wolfe's draglines. (Below): Portable welders paid for themselves on this job

How to Add New Life to Worn Valves

The average truck owner usually saves his worn valves and has several sets in the garage shop. As a general rule 70 per cent to 80 per cent of these valves can be salvaged by a method described in Fusion Facts, a publication of the Stoody Company. It is claimed this salvage method will get 50,000 to 75,000 additional miles of service from worn valves.

In this salvage method the worn valve is hardfaced with Stoody 6, a hardfacing alloy. Before applying Stoody 6, valves should be placed in a lathe and turned down to remove oxides that have formed as a result of heat and the corrosive action of exhaust gases. Best practice is to use a round-nosed tool so the machined area will be concave to provide a recess for the hard metal. (See Fig. 1.) Notice that the outer edge of the valve is not machined. This shoulder furnished support for the rod and also prevents the torch flame from burning away the thin edge and reducing the valve diameter. In making the application it is advisable to put the valve into some type of adjustable motor driven fixture so the valve can be turned slowly while Stoody 6 is being applied to the face. Rotating the valve at an even speed makes it easier for the welding operator to do a good job of hard-facing and eliminates danger of porosity. The jig shown in Fig. 2, designed by a motor bus company, works very well. The use of different sized pulleys and the cutout switch enables the operator to turn the valve as slowly or rapidly as desired. Fractional horsepower motors such as the one pictured are usually available through local electrical supply houses. Either spur or worm gear motors having shaft speeds of one to six r.p.m. may be used for motive power.

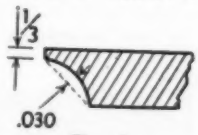


Fig. 1

The best rod size for hard-facing valves is 5/32 in. x 14 in. The torch tip should be about one size larger than would be used in applying mild steel rods of the same diameter, and the torch flame should be definitely carbonizing with the acetylene envelope approximately three times the length of the inner cone. Welding time will, of course, vary with the size of the

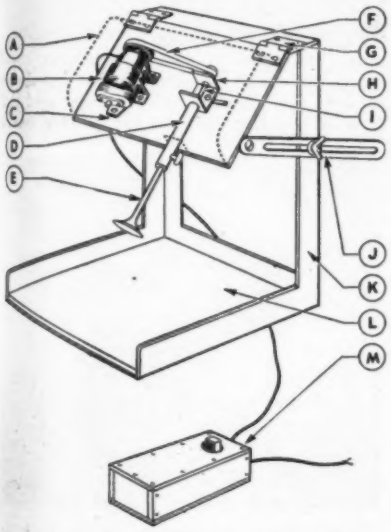
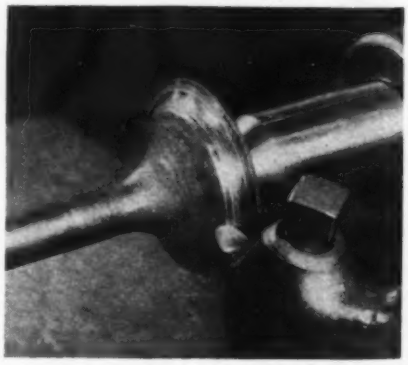


Fig. 2. Jig for Hard-Facing Exhaust Valves
A—Cover, 12 in. x 14 in. x 18 in. Galvanized sheet metal.
B—Motor, 1 R.P.M. back geared.
C—Swinging table, 1/8 in. x 9 in. x 12 in.
D—Valve clamp, machined to fit shaft on one end and valve stem on other (size varies with valve).
E—Valve shown in position.
F—Belt and Pulleys (size will vary according to desired welding speed).
G—Hinges, standard hardware.
H—Shaft bracket, 1/8 in. x 1 1/2 in. x 5 in.
I—Shaft, 1/4 in. diameter x 4 in. drill rod.
J—Adjusting arm, 1/8 in. x 1 in. x 12 in. two required.
K—Frame, 1/8 in. x 1 in. angle; 11 in. two required. 12 in. three required. 1/8 in. strap; 2 in. x 12 in. one required, 1 in. x 12 in. one required.
L—Asbestos plate, 12 in. square.
M—Foot switch. (Any single-pole switch which is "on" when depressed and "off" when released.)

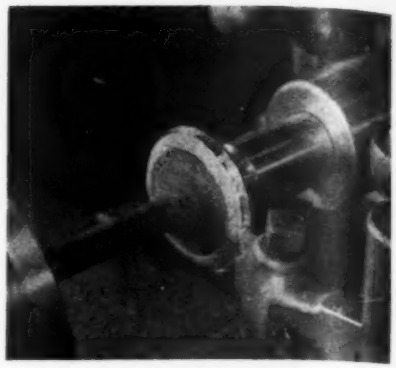
valve, but in no case should more than three minutes be required for the application. After hard-facing, some concerns machine away the high spots in a lathe using carbide tipped tools while others merely place the valve in a grinder and grind the deposit to the required finish and bevel. The illustrations show the entire rebuilding procedure. A folder giving further particulars regarding the salvaging of worn valves can be obtained by writing the Stoody Company, 1125 W. Slauson Ave., Whittier, Calif.

The first step in reclaiming worn valves is to pick out those which are not cracked or greatly undersize. Photo shows the type of valve suitable for hard-facing. (Caution—Do not attempt to hard-face sodium filled valves.)

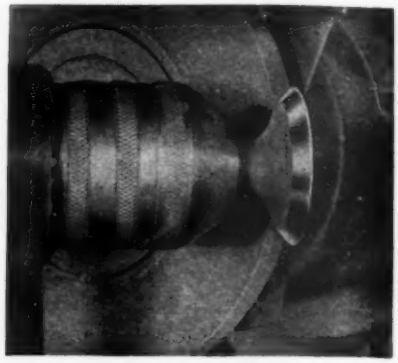


Here the worn valve has been chucked in a small bench lathe and the hard scale is being removed using a round-nosed tool

Applying 5/32 in. diameter rod. When making the application it is advisable to use some sort of motor driven Jig so that the valve can be adjusted to the proper angle and turned by a slow speed motor



After welding, the hard-faced valve is again chucked in a lathe and the high spots machined away with a carbide-tipped tool. Machining is not absolutely essential but should be done wherever possible to minimize grinding and reduce wheel loss



Here the rough machined valve has been placed in a standard valve grinder and the face is being ground to the proper bevel

The finished valve after machining, hard-facing and grinding

(*Continued from page* 68)

quired to fabricate all railroad rail panels and have them on hand at the site of the work, together with all incidental materials and equipment required for their installation, before removal of the bridge deck was permitted. The plan was to remove about 6 ft. of old deck and place one panel in each 45-minute work period.

At the site of this bridge, no detours are available within 60 miles and public traffic, including horse-drawn vehicles had to be accommodated through construction operations at all times. The Contractor was required to maintain a tow car with suitable tackle to tow all horse-drawn vehicles across the bridge during the period that the bridge deck was hazardous for horse traffic. The horses were led across on the sidewalks by the owners.

Fabrication 200 Miles Away

The 6-in. spacing of rails is close enough to form an open grid floor over which traffic could pass with little inconvenience until the concrete and topping were placed, as shown on the accompanying cross-section. Mild carbon scraps were welded to the tops of stringers to act as bearing plates for the individual rails. Some of these straps toe over to form an edge beam for anchorage against lateral displacement of the deck. The Contractor fabricated his panels 200 miles from the bridge site and gathered the other necessary materials preparatory to starting work at the site.

Experiments, made to insure the suitability of welding the railroad rails of relatively high carbon steel to the structural steel stringers, showed that a satisfactory weld could be obtained without injury to the stringers.

The redecking of this structure, consisting of one 336-ft. and one 105-ft. steel truss span cost approximately $24,000. The work was performed by Fred D. Kyle of Los Angeles. The project was planned and financed jointly by the State Highway Departments of Arizona and California.

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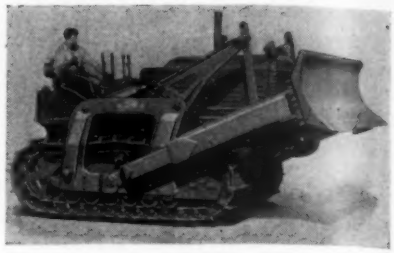
Traffic on Pennsylvania Turnpike

Traffic over the Pennsylvania Turnpike in February, 1944, included 40,568 passengers and 23,721 trucks and busses. This is an increase of 52.7 per cent and 1.9 per cent respectively over the corresponding month in 1943. The change from February, 1941, is a decrease of 39.6 per cent for passenger cars and an increase of 21.1 per cent for trucks and busses.

New Equipment and Materials

New Fabricated Heil Dozers Designed for Cletracs

When it became almost impossible to get steel castings, The Heil Co., Milwaukee, in conjunction with The Cleveland Tractor Co., Cleveland, O., set out to design a line of dozers which would eliminate castings wherever possible. The result of their work was a completely fabricated unit which incorporated all the latest developments in hydraulic dozer design. By pre-fabricating the mounting members and mold board parts it was possible to reduce the "over-hang" weight on the Model "FD" dozer above 2,000 lb. The blade is 11 in. nearer the tractor, and by changes in the linkage the blade action has been speeded up to that of a cable-operated

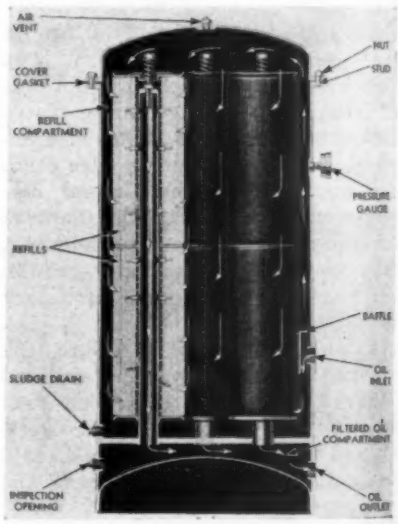


New Fabricated Dozer

blade. The lift of the blade has been increased about 50 per cent, making total lift of the Cletrac "FD" blade 52 ins. These new fabricated bulldozers and trailbuilders are now available on all industrial models of Cletrac tractors, making a complete line of modern streamlined units from 30 to 100 H.P.

New Fuel Oil Filter

An improved standard line of round tank fuel oil fitters for diesel engines has been announced by Briggs Clarifier Co., 1339 Wisconsin Ave., N. W., Washington 7, D. C.



New Fuel Oil Filter for Diesels

New models have been added to broaden the application of Briggs fuel oil clarifiers so that flow capacities range up to 500 G.P.H. Maximum working pressures and hydrostatic test pressures have been established to meet specific demands of the application. For small high speed diesel engines where pressures sometimes run well above 50 P.S.I., the clarifier is designed for a maximum working pressure of 100 P.S.I. and is hydrostatically tested at 150 P.S.I. For large, heavy-duty diesels where pressure is usually between 15 and 25 lb., the clarifier is designed for a maximum working pressure of 40 P.S.I. and hydrostatically tested at 60 P.S.I. Pressure drop across the refills ranges from 0 to 5 P.S.I. on all models.

New 38-Ton High Speed Military Tractor

Following closely the recent announcement of the M-4 artillery tractor by the U. S. Ordnance Department, comes the disclosure of an even larger, more powerful high speed tractor, known as the M-6, also designed and manufactured by the Tractor Division of Allis-Chalmers in cooperation with the U. S. Ordnance Department. Similar in design to the M-4, the M-6 is practically twice as large and powerful, as the M-4.

Known as the 38-ton high speed tractor, and carrying a crew of ten men, this huge tank type tractor imparts speed and mobility to our heaviest artillery. It is designed to pull large guns such as the new 200 mm. and the 240 mm. howitzer. Powered by two huge engines, and resembling a giant tank in general appearance the M-6 develops a tremendous pull coupled with high speed, permitting the rapid movement of artillery over the most difficult terrain. It carries its own ammunition and protects itself from low flying aircraft by a caliber .50 anti-aircraft machine gun. Many other mechanical innovations are still under restriction.

The M-6, 38-ton high-speed military tractor

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Gasoline Hammer Paving Breaker

A new completely self-contained gasoline hammer paving breaker type of demolition tool has been brought out by the Syntron Co., 384 Lexington, Homan City, Pa. This hammer is stated to be comparable in power to the larger-size compressed air paving breakers, weighs 96 lb., and is arranged for easy operation by one man. It uses moil points, narrow

Syntron Self-Contained Gasoline Hammer Paving Breaker

chisels, gads, wide chisels, frost wedges, clay spades, backfill tamping tools, asphalt cutters, sheathing drivers or ground rod driving tools, etc., all with 1⅛ in. x 6 in. shanks. Throttle control of the blow permits placing the tool on the spot desired to be worked, without jumping around. With a solid star drill, and using water to flush the cuttings out of the hole it is stated the hammer will drill rock to a depth of 30 in. In principle, it consists of a 2-cycle gasoline engine in an inverted position—with two pistons, one an engine piston and one a hammer piston. The engine piston is connected to the crankshaft at the top of the hammer and drives the flywheel ignition magneto, and a fan for forced air cooling. Starting is by a rope pull, the same as any outboard engine. The free hammer piston acts as a movable cylinder head for the engine piston, and as the explosion occurs, is driven downward to strike directly on the shank of the tool being used, and then returned to the "up" or firing position by low pressure exhaust gases. Fuel (gasoline mixed with oil) consumption is relatively low. The hammer is equipped with a fuel tank having a capacity sufficient for several hours operation.

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New Method of Fuel Supply for Gasoline Engines

Gasoline Injection, a new method of supplying fuel to the cylinders of gasoline engines is now in production by American Bosch Corporation, Springfield, Mass. Higher efficiency, even with lower-grade gasoline, greater responsiveness, smoother power delivery and elimination of the fire hazard of an explosive mixture of gasoline and air in the induction system, are some of the advantages claimed for the new fuel distribution system. By the system the gasoline is delivered uniformly to every cylinder of the engine. Gasoline Injection is a method of fuel delivery adapted from the diesel engine, in which fuel is delivered to the cylinders in much the same way.

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New Self-Propelled Force-Feed Loader

A new highway maintenance loading machine has been added to the line of the Athey Truss Wheel Co., 5631 W. 65th St., Chicago 38, Ill. Operating as a companion tool to the motor grader on highway maintenance or construction jobs, the Athey force-feed loader loads surplus earth, sod, rock, sand, oil mix and unruly materials into trucks for removal. It also permits the salvaging of valuable

Athey force-feed loader

road surfacing materials for use on other jobs. The force-feed loader is one-man operated and travels under its own power at highway speed from one job to another. Removing windrows of debris thrown out from ditch cleaning is also a job handled by the force-feed loader.

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Barometric Draft Control

A new series of barometric draft controls with exclusive new features has been announced by Perfex Corporation, Milwaukee, Wis. A completely new type of hinge pivot made of spring steel is featured in this barometric. It is stated to eliminate the difficulties often characteristic of the bearing type of hinge pivot as there are no bearings to bind or stick due to sediment or guminess.

With the Manufacturers

Reid New Timken Production Manager

James F. Reid, former Deputy Chief of the Alloy Steel Branch of the War Production Board, has been appointed production manager of The Timken Roller Bearing Co. of Canton, O. Reid had been production manager of the Steel and Tube Division of the Timken Co. before obtaining a leave of absence in May, 1942, to join WPB as chief of the Alloy Steel Section. His activities and responsibilities in this new capacity extend to all divisions of the company. He first joined the Timken Co., 25 years ago as an employee in the production department, becoming, ten years later, production manager of the Steel and Tube Division.

Russell W. Long Appointed H. O. Penn Branch Manager

Announcement has just been made by the H. O. Penn Machinery Co., New York City, of the appointment of Russell W. Long as manager of the Mineola, L. I., branch office and service shops. Mr. Long has been sales representative of the company for the past seven years and is well known throughout New Jersey where he has been concentrating his efforts. He is filling the vacancy left by Jack Frost, who has been in charge of the Minneola Branch since its establishment, but who recently purchased the controlling interest in the Michigan Tractor & Machinery Co., of Detroit and Grand Rapids, Mich.

R. W. Long

Appointed Marion Distributor in Washington

The Marion Steam Shovel Co., Marion, O., has announced the recent appointment of Star Machinery Co., Seattle, Wash., as its new distributor in the eastern half of the state of Washington. The Star Machinery Co., Construction Equipment Division, under the direction of Jack T. Hatten, is close to the construction industry of the Pacific Northwest and in excellent position to serve. Complete sales and service facilities are available and it is planned to carry an adequate parts stock to service the many Marion machines already in the field. The Star sales and service organization will operate in close cooperation with Joe Reed, Marion Northwest District Representative, with headquarters in Portland, Ore.

American-Marietta Purchases New Company

Expansion of the American-Marietta Co. into the Southwest through the purchase of the Sewall Paint and Varnish Co. has been announced by Grover M. Hermann, president. Acquisition of the 67-year-old company with plants in Kansas City and Dallas is part of an over-all expansion program that will include the construction of new factories and improvement and enlargement of present facilities when restrictions are lifted.

Koehring Dandie Mixers to Be Manufactured and Sold by Subsidiary Company

The Kwik-Mix Concrete Mixer Co., Port Washington, Wis., a subsidiary of the Koehring Co., Milwaukee, 10, Wis., who has manufactured the well known Koehring Dandie mixers for eight years, will now assume the sale, service, engineering and development of the 7-S, 10-S and 14-S Dandie mixers. Kwik-Mix Dandie mixers, as they will now be known, will continue to be of the same or better quality with the same important features. Service will be directed from the Kwik-Mix Concrete Mixer Co. Inquiries for information are to be addressed to Kwik-Mix at Port Washington. The Kwik-Mix Concrete Mixer Co. also manufactures tilting and non-tilting 3½-S mixers, mortar mixers, plaster mixers and bituminous mixers. This change in sales, service and engineering took effect March 31, 1944. The present distributor organization will be considerably increased, as announced by A. E. Kelbe, recently appointed sales manager for Kwik-Mix, the provide adequate coverage for post-war sales.

McIlwraith of Barber-Greene Retires

After 27 years of service with Barber-Greene Co., Aurora, Ill., practically all of that time as secretary, D. G. McIlwraith has announced his retirement, effective immediately. Mr. McIlwraith joined Barber-Greene within a year of the founding of the company to complete the founders' organization. For the past two years, much of Mr. McIlwraith's time has been taken up with the office building expansion program in Aurora.

D. G. McIlwraith

J. M. Spence

John M. Spence has been elected to the board of directors and to the office of secretary. Mr. Spence joined Barber-Greene in 1918 and for the past 25 years has been chief auditor.

Miller Machinery Co. New Caterpillar Distributor

The appointment of the Cliff Miller Machinery Co. as distributor for Omaha, Neb., and surrounding territory has just been announced by Caterpillar Tractor Co. Headquarters for the new firm will be at Omaha with a store located at Sioux City, Iowa. Cliff Miller, who has been associated with the distribution of "Caterpillar" and allied equipment in this territory for over 20 years, will become general manager, and assistant manager will be M. Lee Coonan, who has been a district representative for LaPlant-Choate Mfg. Co. of Cedar Rapids, Ia., for a number of years. Sales manager for the concern will be Clare Fintzell, who has had wide experience in the sale of this equipment.

Left to right: J. J. Valentine, Central Sales Manager, Caterpillar Tractor Co.; G. E. Spain, Vice President, Caterpillar Tractor Co.; M. Lee Coonan, Assistant Manager, Cliff Miller Machinery Co.; Clare Fintzell, Sales Manager, Cliff Miller Machinery Co.

New Distributors for Le Tourneau

Seven more distributors have been signed by R. G. LeTourneau, Inc., Peoria, Ill., under its new sales policy. The newest list includes R. E. Brooks Co. of New York City, Furnival-Rimmer Co. in Philadelphia, Drave-Doyle Co. at Pittsburgh, Costello Equipment Co. at Calgary, Chicago Construction Equipment Co. in Chicago, Parker-Danner Co. at Hyde Park, Mass., and Miller-Hasselbalch Co. of Omaha. In addition to handling LeTourneau Tournapulls, Carryall scrapers, dozers, power control units, Tournarope, Tournaweld and other LeTourneau products, these dealers are continuing to represent other, non-competitive lines for other, equally prominent manufacturers. Previously signed new LeTourneau dealers included Loggers and Contractors Machinery Co. of Portland, Ore.; The Victor L. Phillips Co. at Kansas City, Mo.; the Nicoll-Talcott Corporation at Hartford, Conn.; Wylie-Stewart Machinery Co. in Oklahoma City, Okla.; General Supply and Equipment Co. of Baltimore, Md.; Tri-State Equipment Co. in Memphis, Tenn., and General Supply Co. of Canada, Ltd., at Ottawa.

Davis Promoted by Cletrac

W. E. Miles, Industrial Sales Manager, has announced the promotion of H. W. Davis to Assistant Industrial Sales Manager of The Cleveland Tractor Co. Mr. Davis is well known throughout the entire tractor industry. For the past two years Mr. Davis has been with the sales division of Cletrac at their home office in Cleveland, and he has been connected with The Cleveland Tractor Company for over 20 years. Mr. Davis' father, H. F. Davis, operates sales organizations in Boston and Holyoke, Mass., and "Herb" Davis grew up in the business. He started as a service man in his father's organization and later headed up the sales division of the H. F. Davis Tractor Co. In 1935 he started a dealership in Pittsfield, Mass., and sold it in 1939 to become district sales engineer for Cletrac in New York City.

H. W. Davis

Atlas District Offices to New York

The Philadelphia District sales offices of the Explosives Department of Atlas Powder Co. are being moved to New York City, May 22, 1944. The new offices will be located in the Empire State Bldg., 350 Fifth Ave. Explosives sales offices, formerly at 60 East 42nd St., New York, are being moved to the new location. A sales office is being maintained at the old address in Philadelphia. W. C. Manning, Assistant Director of Sales of the Explosives Department is transferred from the general offices of Atlas at Wilmington, Del., to take charge of the new offices, succeeding E. W. Moorehouse, who will retire July 1 after 44 years with the explosives industry. Mr. Manning entered the explosives industry 25 years ago.

W. C. Manning

A-C Elects Three New Vice-Presidents

Announcement of the election by the board of directors of three new vice-presidents has been made by Walter Geist, president of Allis - Chalmers Manufacturing Co. They are W. A. Roberts, Wm. C. Johnson and James M. White.

W. A. Roberts

Mr. Roberts is no stranger to the tractor industry, having been actively connected with the Allis-Chalmers Tractor Division for 20 years. Starting as a blockman out of the Wichita (Kansas) branch, he served in various capacities until 1931, when he was appointed general sales manager of the Tractor Division. In this position he developed the organization that made Allis-Chalmers the factor in the industry it is today. In 1941 he succeeded the late Harry C. Merrit as manager of the Tractor Division, a title which he still retains with his promotion to vice-president.

W. C. Johnson

J. M. White

Mr. Johnson, a native of Birmingham, Ala., joined the Allis-Chalmers organization in 1924 as a field engineer in their mining and cement making machinery divisions. He entered the sales department in 1929 at the company's Atlanta office, and in 1937 became manager of the Knoxville District office. In 1940 he was brought to Milwaukee and placed in charge of sales for the Crushing and Cement Machinery Department, and in 1942 was appointed general sales manager of the General Machinery Division. As vice-president he will continue in charge of sales of all products excepting those of the Tractor Division. Mr. White, also an Alabaman by birth, joined the company's mauufacturing department in 1929. Later he successively served as acting works manager at the La Crosse plant and works manager at the La Porte plant. In 1941 he was appointed general works manager in charge of manufacturing. As vice-president, he will direct the company's manufacturing

New Industrial Power Division, International Harvester

In connection with International Harvester Co.'s new divisional organization plan, which became operative March 1, the Industrial Power Division, with H. T. Reishus as general manager, assumed direction of and responsibility for the Harvester Company's entire industrial power business. Other divisions now in operation are the Motor Truck Division, Farm Tractor Division, Farm Implement Division, Steel Division, and Fibre and Twine Division. The Industrial Power Division is a complete division with its own sales organization. Neal Higgins is manager of sales, and G. A. Gilbertson and W. M. Parrish are assistant sales managers. Managers in the Industrial Power Division, in addition to Mr. Higgins, include: D. B. Baker, manager of engineering; H. B. Rose, manager of manufacturing; W. M. Holland, manager of supply and inventory; and M. L. Allen, divisional comptroller. The sales department will function under Mr. Higgins, with the two assistant sales managers, and R. C. Flodin as assistant to the manager.

H. T. Reishus

Neal Higgins

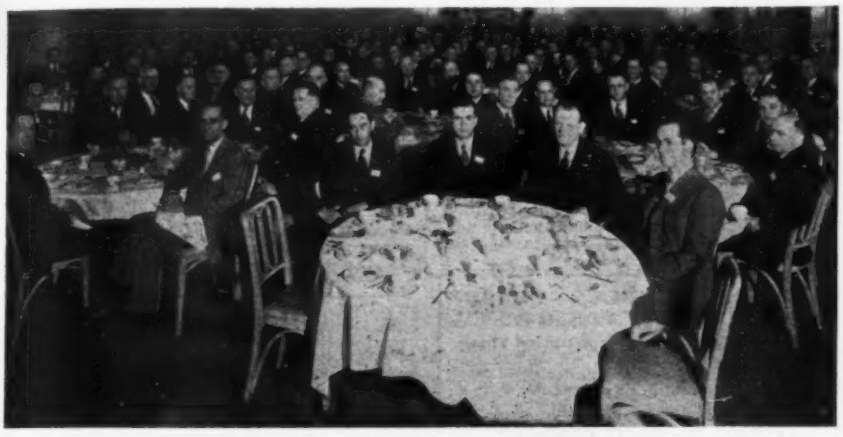
The United States has been divided into zones under zone managers. These men, who will contact distributors and dealers, are under Mr. Gilbertson. The latter will also maintain relations with contacting and servicing branches of the company. Mr. Parrish, as in the past, will contact manufacturers in the direct sale of International industrial power. W. W. Black, who has worked with International distributors and branches on industrial power service, is supervisor of the service and parts section. Sales engineering, which includes allied equipment and modified units, is under supervision of E. A. Braker. The company's large Tractor Works in Chicago and Milwaukee Works in Milwaukee are the industrial power division plants. J. W. Phillips is general superintendent of Tractor Works, and R. E. Bloye has the same position at Milwaukee Works.

Guthrie New Field Sales Manager of Buckeye

A. M. Guthrie has been advanced from eastern district manager to field sales manager of the Buckeye Traction Ditcher Co., according to an announcement by Paul B. Cochran, General Manager. "Al" is assuming the entire handling of distributor policies and appointments through the company's district managers. His headquarters will be at the plant, Findlay, O.; but, as postwar plans crystallize, he will travel extensively.

Fairbanks, Morse Open New Office

Fairbanks, Morse & Co. have opened a new office in Tulsa, Okla. The office is under the management of Frank D. Ratcliffe, District Manager, Oil Industry Sales, and is located at 1335 Hunt Bldg.



Breakfast party at Hotel Roanoke, Roanoke, Va.

Reilly Tar Officials Entertain at Breakfast

J. H. Barnett, Jr., and Henry Green, of the Chattanooga office of the Reilly Tar & Chemical Corporation, were hosts at a "Bituvia" breakfast at the Hotel Roanoke, Roanoke, Va., which was attended by approximately 200 members of the Southeastern State Highway officials which met at Roanoke recently. The breakfast was served in true southern style. One of the most enjoyable features was there was no program—no toastmaster—no speeches. Reading from left to right in the illustration, front row, are: J. H. Barnett, Jr., and Henry Green, hosts; H. J. O'Neal, Virginia; R. P. Ellison, Virginia; Charles M. Upham and Tom Keefe of American Road Builders, Washington, D. C.; Burton Marye, Virginia; H. J. Blackmon, H. E. Graves, M. D. Mosely and W. F. Hudson, all of South Carolina.

New Kotal Distributor in Texas

The Kotal Co. has announced the appointment of The Lofland Co., Dallas, Tex., as distributor of Kotal in the State of Texas. This company was established in 1937—succeeding the May & Lofland Corporation organized in 1934. The organization, which is headed by Ralph F. Lofland, represents several well known national manufacturers of construction material.

Creagh Promoted by American Chain & Cable Co.

Edward V. Creagh has been appointed advertising and sales promotion manager of American Chain & Cable Co., Inc., and Associate Companies, Bridgeport, Conn. Mr. Creagh joined the company in 1916, and his service has been continuous, except during World War I, when he was in the Army. He has been in charge of sales promotion activities since 1936. His new duties will cover newspaper, magazine, business publications, and other forms of advertising, in addition to sales promotion. The advertising of American Chain & Cable includes Weed tire chains, Tru-Lay preformed wire rope, Reading-Pratt & Cady valves, Page welding wire and chain link fence, Wright hoists, Manley garage equipment, Owen springs, Campbell abrasive cutting machines, Push-Pull controls, Hazard wire rope, American industrial and hardware chain. One of the organizers and first president of the Western New England Chapter of National Industrial Advertisers Association, Mr. Creagh is now serving as a vice president of the National organization.

Bell Appointed General Sales Manager

G. A. W. Bell, Jr., has been appointed general sales manager of the Connelly Machinery Co., Distributors, Billings, Mont. Mr. Bell had been with the Caterpillar Tractor Co. as District Manager with headquarters at Denver, Colo. Prior to going with Caterpillar he was manager of sales to railroads in the U. S. and Canada for Northwest Engineering Co., Chicago, and before that, he was maintenance supervisor and inspector for the B. & O. R. R. Co.

New Sullivan Vice Presidents

Sullivan Machinery Co., Michigan City, Ind., has announced the election of J. A. Drain, Jr., as vice president in charge of product engineering, research and development. Mr. Drain was formerly assistant to the president, and prior to joining the Sullivan Co. was president of the Stefco Steel Co. O. J. Neslage has been elected vice president of Sullivan and will have charge of sales in the United States and Mexico.

Mr. Neslage during the past year was general sales manager.

Clearing House

EXCEPTIONAL BARGAINS
IMMEDIATE SHIPMENT

FOR SALE:

1—Barber-Greene Hot Asphalt Plant
1—Barber-Greene Bituminous Finisher
1—Barber-Greene 44C Ditcher
1—Barber-Greene 82A Bucket Loader

FOR RENT:

522 Barber-Greene Pneumatic Tired Bucket Loader—Gasoline Power.

PAUL L. MATCHETTE COMPANY

Exclusive Distributors for Barber-Greene Co.

Missouri — Kansas — Oklahoma
20 West 9th Street, Kansas City, Mo.

LIQUIDATION SALE

Liquidating Red Granite Quarry at Lohrville, Wis.; 5 Guy Derricks, 3 Gyratory Crushers, 1 Symons Horizontal Disc Crusher, 2 Electric Hoists. Grout Cars, and numerous other items; 2 75 HP. Motors, 1 Allis Chalmers Revolving Screen, 1 11,000 gallon Oil Tank; Rail, Pipe and Air Receivers; complete inventory on request. Write KLATZY BROS at Calumet, Mich.

TIRE REPAIRS

In all sizes of tractor, truck, wheelbarrow, passenger or 1800x24 tires.
An Equa-Flex "Sectional" repair constructed in your tire is guaranteed. Best results and prompt service!
It is a fact that we do repair run flat tires, passenger and truck, without a reliner!

WALLACE TIRE SERVICE, Inc.
2320 S. Michigan Ave. Chicago, Ill.

WANT TO BUY

2 Ton or 1 Ton Asphalt Plant.

2—1½ to 5 Ton Rollers.

4—Distributor Trucks.

THE DARIEN CORPORATION
DARIEN, CONN.

For Sale

Trenchers
Cleveland Pioneer; 26" x 10'; adjustable boom.
Parsons 21; excellent condition.
P & H 10-30; 35" x 13'; adjustable boom.
Buckeye No. 4; (Farm) 24-30" x 8'6".
Cleveland Baby; 22" x 5'6".

Tractors
35 Caterpillar; Trackson Side Boom.
40 Caterpillar; Diesel; LeTourneau Angledozer.
50 Caterpillar; Euclid Hydraulic Bulldozer.
D-8 Caterpillar; 14 yd. LeTourneau Scraper; LeTourneau Angledozer.
T-20 International; Bucyrus-Erie Angledozer.

Auto Patrols
Adams 51; dual tandem; 14' blade.
Caterpillar Diesel 11; dual wheel.
Austin-Western 77; dual tandem; 12' blade.
7-S Jaeger Mixer; 4 cyl.; excellent rubber; hoist.
10B Bucyrus-Erie Shovel.
600A P & H 1¼ Shovel; D-11,000 Caterpillar Diesel Engine.
Insley ½ yd. Dragline.
40 Lorain Combination Dragline and Shovel.
75A Lorain Shovel.
75B Crane.
10-30 Bucyrus-Erie Crane Boom and Backhoe Attachments.
Two 600 Smith Welders.

THE CHAS. M. INGERSOLL CO.
Rocky River 16, Ohio.

FOR SALE

Tanks
5—10,000 gal. & 12,000 gal. R.R. Car Tanks with coils.
4—15,000 & 18,000 gal. cap. horiz.

Pavers—Mixers
34E Rex Dual Drum Paver.
2—27E Koehring 2A Pavers.
3—1 yd. and 3 yd. Elec. or Gas. Mixers.
4—56S Smith 2 yd. Electric Mixers.

Asphalt Equipment
5—½ ton, 1 ton & 2 ton Asphalt Plants.
4—4x24, 5x30, 5x60 Rotary Dryers.
4—Kinney & Etnyre 1,000 gal. Distributors.
3—8 Ton & 10 Ton Tandem Rollers
2—Jaeger MP 118 & MP 2 Road Builders.

R. C. STANHOPE, INC.
60 East 42nd St. New York, N. Y.

FOR SALE—Caterpillar 60 Elevating Grader, power take-off driven, 42 in. carrier. Extra tumbling rod with knuckle joints to fit above grader. 1¼ yd. Euclid Rotary Scraper. Power Take-off Box to fit Allis Chalmers Model L Caterpillar Tractor. Will also sell as a unit my complete Grading outfit consisting of: Allis Chalmers Model LL Caterpillar Tractor, Heil 9½ yd. Hydraulic Scraper, Austin-Western Contractors Special Elevating Grader and Adams No. 12 Blade Grader. All machinery in good mechanical condition. Box 66, Roads and Streets, 330 So. Wells Street, Chicago 6, Ill.

SALE OF SURPLUS EQUIPMENT BY PRIVATE OWNER

Schramm 315 C.F.M. Air Compressor on wheels.
Cement Gun and accessories.
Rex Concrete Pump and accessories.
Also many other contractor's items.

Write for complete list

LASTING PRODUCTS COMPANY
Baltimore 23, Md.

FOR SALE OR RENT

Buckeye No. 260 Ditcher in good mechanical condition. Twin City 6-cylinder gas motor; 9 ft. Cat. Type Rear Tread, steel front wheels; Cuts 108" width, 24' deep, with extension 35' deep. Spoils dirt on either side. Price on application. Can be inspected at our shop in Alexandria, La.

Buckeye No. 203 Ditcher in good mechanical condition. Twin City 4-cylinder gas motor; 7 ft. Cat. Type Rear Tread, steel front wheels; Cuts 45" to 47½" width, 17' deep, with extension 21' deep. Spoils dirt on either side. Price on application. Can be inspected at our shop in Alexandria, La.

Buckeye Wheel type Ditcher in good mechanical condition. For V8 motor. Cuts 24" width, 7' deep. Price on application. Can be inspected at our shop in Alexandria, La.

Hendrix 2½ cu. yd. Dragline Bucket in A1 condition, complete with dump sheaves, spreader bar and drag chains. Price on application. Can be inspected at our shop in Alexandria, La.

T. O. WELLS MACHINERY DIVISION
Alexandria, La.

Position Wanted

Superintendent—27 years' experience in the construction and maintenance of highways — dirt — tar — asphalt — concrete. Sanitary sewers—Storm sewers—culverts, etc. Private—Municipal—County. 47 years of age. Grown family. In perfect health. Available June first. Address Box 100, Roads and Streets, 330 So. Wells Street, Chicago 6, Ill.

BUY WAR BONDS

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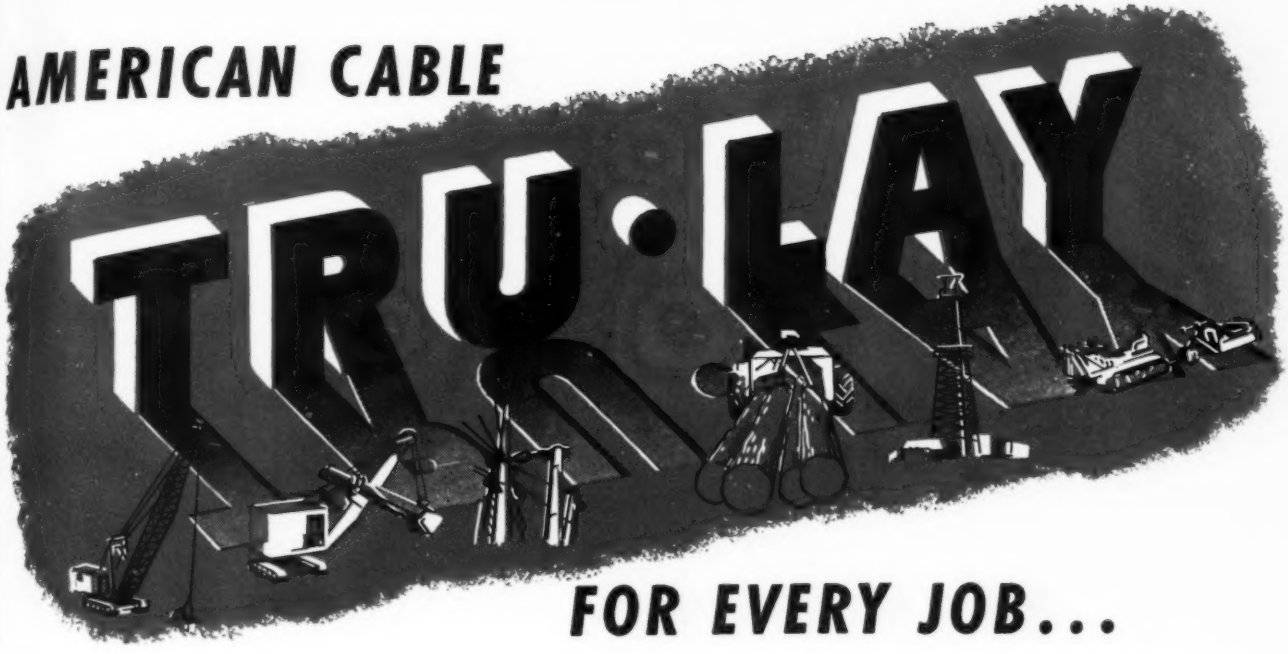
AMERICAN CABLE



FOR EVERY JOB...

TRU-LAY Preformed saves time. Yes, this rope saves time—the most vital commodity in industry, the most important factor in winning the war.

TRU-LAY saves time by reducing the number of shut-downs for replacement. That's because it lasts longer.

It also saves replacement time because it's more flexible and easier to handle. You don't have to seize the ends of **TRU-LAY** Preformed.

It saves time because it's safer. Broken crown wires in **TRU-LAY** lie flat. They don't wicker out to jab hands and cause infection.

All these and many other advantages of **TRU-LAY** come from its being perfectly preformed.

AMERICAN CABLE DIVISION
Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

ESSENTIAL PRODUCTS...TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, MANLEY Auto Service Equipment, MARYLAND Bolts and Nuts, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Steel Castings, WRIGHT Hoists, Cranes . . . *In Business for Your Safety*

Massachusetts knows

how little it costs to maintain

ASPHALTIC CONCRETE HIGHWAYS

TOP: Rollers put the finishing touches to a hot, plant-mixed Asphaltic Concrete pavement.

BOTTOM: In addition to long life and low upkeep, Texaco Asphaltic Concrete makes a vital contribution to safe driving through its highly skid-resistant surface.

It would be hard to find more conclusive proof of the low upkeep cost of Asphaltic Concrete paving than the maintenance records of the Massachusetts State Highway Commission.

With almost 5,000,000 square yards of Asphaltic Concrete on its highway system, Massachusetts, according to the Asphalt Institute, has spent for maintenance over a period of 17 years an average of only $.0094 per square yard per year.

Compare this maintenance figure of less than one cent per square yard per year with the upkeep costs of your own heavy-duty paving for a similar period.

Upkeep cost is an important factor to be considered in making a choice between different types of pavement for heavy traffic. Certainly the experience of Massachusetts, with its substantial yardage of Asphaltic Concrete, extending over a period of many years, should carry considerable weight.

Wherever a heavy-duty pavement is needed, it is sound practice to construct hot, plant-mixed Texaco Asphaltic Concrete. A Texaco Engineer, who is an Asphalt specialist, will be glad to cooperate with you.

THE TEXAS COMPANY, Asphalt Sales Dept., 135 East 42nd Street, New York City 17
Boston 16 Philadelphia 2 Richmond 19 Chicago 4 Houston 1 Jacksonville 2

TEXACO
REG. T. M.

TEXACO ASPHALT